

The Relationship of School Sports Participation with Physical Performance and Anthropometric Profiles in Middle School Students

Mehmet Burak DEMİR¹, Ömer ÇİFTÇİOĞLU²

ABSTRACT

Purpose: The aim of this study is to compare the physical performance and anthropometric characteristics of middle school students who participate in school sports and those who do not, and to analyze the developmental differences and outcomes of regular sports activities.

Method: The study, conducted using a correlational survey model, included 870 students (450 participating in sports, 420 not participating) from middle schools in Elazığ province, selected based on their participation in school sports. A physical measurement form was used to collect data, including height, weight, push-ups, sit-ups, vertical jump, arm strength, agility, and a 20-meter run. Data analysis was performed using SPSS 23.0 software. Normality tests (Kolmogorov-Smirnov, Shapiro-Wilk), Mann-Whitney U and T-tests for pairwise comparisons were applied

Results: The analyses revealed that students participating in school sports exhibited significantly higher performance in strength, endurance, and speed parameters ($p < 0.05$), while their body weights were lower. The push-ups, sit-ups, vertical jump, and arm strength performances of students participating in school sports were significantly higher than those of their non-participating peers ($p < 0.05$). Regarding gender, male students performed better than female students in push-ups, sit-ups, and the 20-meter sprint. Significant differences were found between groups in flexibility and agility values ($p < 0.05$).

Conclusion: The research results demonstrate that participation in school sports is associated with better physical and motor performance among students. Participation in sports provides a significant advantage, particularly in tests requiring strength and endurance. These findings highlight the importance of guiding students towards school sports and similar structured physical activities for their healthy physical development. However, curriculum diversity is needed to develop specific motor skills such as flexibility.

Keywords: School Sports, Physical Performance, Middle School Students, Physical Education, Physical Development

ÖZET

Ortaokul Öğrencilerinde Okul Sporlarına Katılımın Fiziksel Performans ve Antropometrik Profillerle İlişkisi

Amaç: Bu çalışmanın amacı, okul sporlarına katılan ve katılmayan ortaokul öğrencilerinin fiziksel performans ve antropometrik özelliklerini karşılaştırarak, düzenli sportif faaliyetlerin gelişimsel farklarını ve çıktılarını analiz etmektir.

Yöntem: İlişkisel tarama modelindeki araştırmaya, Elazığ ilinde, ortaokul düzeyinde öğrenim gören, okul sporlarına aktif katılım sağlayan ve sağlamayan öğrenciler arasından 870 (450 spor yapan, 420 spor yapmayan) öğrenci çalışma grubunu oluşturmaktadır. Verilerin toplanmasında; boy, kilo, şınav, mekik, dikey sıçrama, kol kuvveti, çeviklik ve 20 metre koşu testlerini içeren fiziksel ölçüm formu kullanılmıştır. Verilerin analizinde SPSS 23.0 programı aracılığıyla;

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¹ Munzur University Faculty of Sport Sciences, Department of Sports Management, Tunceli /TÜRKİYE. ORCID NO: 0000-0003-4951-9412, burakdemir@munzur.edu.tr

² Elazığ Provincial Directorate of National Education, Elazığ /TÜRKİYE. ORCID NO: 0009-0000-5255-1187, omer_ciftcioglu@hotmail.com

normallik testleri (Kolmogorov-Smirnov, Shapiro-Wilk), ikili karşılaştırmalar için Mann-Whitney U ve T-testi uygulanmıştır.

Bulgular: Yapılan analizler, Okul sporlarına katılan öğrencilerin kuvvet, dayanıklılık ve sürat parametrelerinde anlamlı derecede yüksek performans sergilediği vücut ağırlıklarının ise daha düşük olduğu saptanmıştır. Okul sporlarına katılan öğrencilerin şınav, mekik, dikey sıçrama ve kol kuvveti performanslarının, spor yapmayan akranlarına göre anlamlı derecede yüksek olduğunu göstermiştir. Cinsiyet değişkeni açısından bakıldığında, erkek öğrencilerin şınav, mekik ve 20 metre sürat testlerinde kadın öğrencilere oranla daha yüksek performans sergilediği saptanmıştır. Esneklik ve çeviklik değerlerinde de gruplar arası anlamlı bir fark saptanmıştır.

Sonuç: Araştırma sonuçları, okul sporlarına katılımın öğrenciler arasında daha iyi fiziksel ve motor performansla ilişkili olduğunu göstermektedir. Spor yapma durumu, özellikle kuvvet ve dayanıklılık gerektiren testlerde belirgin bir avantaj sağlamaktadır. Bu bulgular, öğrencilerin sağlıklı fiziksel gelişimleri için okul sporları ve benzeri yapılandırılmış fiziksel aktivitelere yönlendirilmesinin önemini ortaya koymaktadır. Bununla birlikte, esneklik gibi spesifik motorik özelliklerin geliştirilmesi için müfredat çeşitliliğine ihtiyaç duyulmaktadır.

Anahtar Kelimeler: Okul Sporları, Fiziksel Performans, Ortaokul Öğrencileri, Beden Eğitimi, Fiziksel Gelişim.

INTRODUCTION

In today's modern society, physical activity is a fundamental element that not only protects children's physical health but also supports their social and psychological development. The 10-14 age range, in particular, represents a critical period in which psychomotor development accelerates, motor skills are reinforced through coordination, and the central nervous system continues to mature (Gürkan and Özkan, 2023). Regular physical activity during this period is known to support fine motor control and systematically improve components such as agility, balance, and reaction time (Korkmaz and Yıldız, 2021). However, the sedentary lifestyle brought about by technology risks negatively impacting the physical development processes of children in this age group. Schools are the most strategic institutions in terms of instilling sports habits in children and integrating physical activities with academic discipline (Aksoy, 2018). In Turkey, the "School Sports" projects, carried out in cooperation with the Ministry of Youth and Sports and the Ministry of National Education, contribute to the process of training national athletes by encouraging students' participation in sports activities at local, national, and international levels. School sports: Sports activities not only increase students' physical endurance but also have positive effects on the development of moral behavior, sense of belonging to the school, and decision-making skills (Aslan and Sağın, 2021; Turan, 2020). Regular participation in sports activities strengthens the musculoskeletal system and increases the mobility of the locomotor system as a scientific fact (Mutlu-Bozkurt, 2024).

Studies in the literature indicate that physical activity levels and sports preferences may also differ according to gender. It is argued that male students generally gravitate towards

strength and performance-oriented sports, while female students show interest in activities requiring aesthetics and skill (Jackson and Marsh, 1986; Yalçınkaya et al., 1993). However, there is still a need for current comparative studies that comprehensively examine the effects of middle school students' participation in school sports on specific motor skills such as push-ups, sit-ups, agility, and vertical jump.

Current international literature and large-scale meta-analyses confirm that physical activity patterns and motor performance outcomes show significant variations according to biological sex and socio-cultural gender perceptions. The sharp dichotomy in past literature (e.g., studies from the 1980s and 90s) suggesting that male students gravitated towards absolute strength and performance-oriented sports, while female students gravitated towards aesthetic and rhythmic skills, has been replaced in current research by the multidimensional dynamics of equal opportunity, neuromuscular adaptation speed, and motivation for participation in sports (World Health Organization [WHO], 2020; Poitras et al., 2016; Tompsett et al., 2017). Modern meta-analytic findings indicate that the motor skill acquisition potential of boys and girls in early adolescence is neurophysiological similar, but their specialization tendencies and levels of participation in school-based physical activities directly differentiate their biomotor profiles (Quatman-Yates, C. C et al., 2012). However, there is still a need for in-depth studies comparing the basic motor performance parameters (push-ups, sit-ups, agility, and vertical jump) and anthropometric indices of middle school students who actively participate in school sports with those who do not, using current measurement batteries.

The main objective of this study is to comparatively examine the physical performance parameters (muscular endurance, explosive power, agility) and anthropometric measurements of middle school students who participate in school sports organizations and those who do not. The findings are expected to provide evidence-based data on the role of school sports in children's physiological and motor development processes; thus, it is anticipated that this will serve as a scientific reference for physical education teachers, coaches, and macro-level education policymakers in developing a holistic physical literacy strategy.

METHODS

Research Design

Although the broad objective of this research is to evaluate the physical profiles of middle school students based on their sports participation, the study is fundamentally cross-sectional and causal comparative in design, rather than a direct longitudinal causal experiment. Since

cross-sectional data cannot directly establish temporal causality, this model focuses on examining the significant differences and covariations in physical performance parameters and anthropometric measurements between active sports participants and non-participants (Karasar, 2005). This research was designed using a correlational survey model, a quantitative research method, to determine the effect of school sports participation on the physical performance parameters of middle school students. This model aims to determine the existence and/or degree of covariation between variables (Karasar, 2005).

Participants

The population of the study consists of 2651 students studying in official secondary schools in the central district of Elazığ province during the 2023-2024 academic year and participating in school sports with licenses. The "convenience sampling" method was preferred in sample selection. A total of 870 students were included in the study from 30 schools selected from 66 secondary schools in the central district of Elazığ; 450 students who participated in school sports with licenses and had obtained guardian consent, and 420 students who did not participate in school sports as a control group. With a 95% confidence level and a 5% margin of error, the sample size calculation ($n=336$) exceeded the target number, and the sample's representativeness of the population was kept high.

This study was approved by the Munzur University Non-Interventional Research Ethics Committee with decision number 2024/4 dated 25.04.2024 and is derived from the thesis titled "The Effect of School Sports on the Physical Development of Middle School Students"

In determining the population and sample; the Ministry of Youth and Sports - General Directorate of Sports Services, General Directorate of Education Research and Coordination (Research and Policy Development Department) letter dated 16.06.2025 with number 11188698 was obtained, and the number of schools participating in school sports activities and the number of licensed athletes in the middle school level in the Central district of Elazığ province during the 2023-2024 academic year were determined for use in the thesis study titled "The Effect of School Sports on the Physical Development of Middle School Students".

Data Collection Methods and Tools

To ensure intra- and inter-rater reliability, all anthropometric and physical fitness assessments were administered by three certified physical education teachers who underwent a comprehensive 10-hour standardization training program prior to field testing.

All field tests were completed over a two-week period under strict environmental controls:

Environmental & Time Standardization: All measurements were conducted between 09:00 AM and 12:30 PM in indoor school gymnasiums (20-22 °C) to eliminate circadian rhythm variations and weather-induced performance fluctuations.

- **Fatigue Management:** Students were instructed to avoid strenuous physical exertion 24 hours prior to testing. A standardized 10-minute dynamic warm-up protocol preceded all sessions. A strict 3-to-5-minute passive rest interval was enforced between consecutive attempts, and a 15-minute rest period was maintained between different test stations to prevent cumulative neuromuscular fatigue.

Data collection was based on the "Personal Information Form" along with the protocols of the Ministry of Youth and Sports' Turkish Sports Talent Screening and Sports Orientation Program and the Ministry of National Education's "Health-Related Physical Fitness Report Card". Measurements were made according to the following standards:

- **Anthropometric Measurements:** Body weight was measured with a digital scale, and height was measured with a stadiometer with heels, hips, and head in a vertical line.

Flexibility (Reach): The distance reached forward with both hands without bending the knees was measured on a flexibility board.

Explosive Power (Vertical Jump): The height of the vertical jump achieved with the active use of the arms on a jumping mat was recorded.

Upper Extremity Strength (Arm Strength): The best score was recorded with a backward medicine ball throw test at a 30-degree throwing angle.

Speed and Agility: 20-meter sprint with the aid of a photocell; Agility was measured using a change of direction protocol over a distance of 4.57 meters.

Muscle Endurance (Sit-ups and Push-ups): Maximum repetition numbers were determined using 90-degree elbow angle (push-ups) and proper toe-tracking (sit-ups) protocols.

Data Analysis

Statistical processing was performed utilizing SPSS v23.0 software. Data normality was rigorously verified using the Kolmogorov-Smirnov and Shapiro-Wilk tests alongside skewness and kurtosis coefficients ($\pm 1,5$ bounds). For the comparative analysis between the school sports participants and the control group, the Independent Samples T-Test was utilized for normally

distributed variables, while the Mann-Whitney U Test was applied to non-parametric data distributions. Statistical significance was set a priori at $p < 0.05$.

RESULTS

The research findings were grouped along three main axes: The Effect of Sports Participation: Students participating in school sports showed a statistically significant advantage ($p=0,000$) over their non-participating peers in push-ups, sit-ups, vertical jump, 20m sprint, and arm strength tests. Gender Factor: Male students achieved higher scores than female students in strength and speed tests, but there was no significant difference between genders in flexibility and agility values ($p > 0,05$). Socio-Economic Findings: The higher scores achieved by students living in the city center and belonging to the middle/low-income group in physical performance tests were interpreted as indicating that these groups have higher levels of natural physical activity in their daily lives. In this section, the relationships between the demographic characteristics of the participants and physical performance parameters were analyzed in terms of gender, grade level, participation in school sports, and socio-economic variable.

Table 1. T-test analysis of students who participate in sports activities and those who do not.

Variable	Group	n	x	S.D.	Cohen's d	P
Height (cm)	Not participating in school sports	420	150,06	4,43	0.08	0,305
	Participating in school sports	450	152,46	4,43		
	Total	870				
Weight (kg)	Not participating in school sports	420	42,532	9,24	0.27	0,022*
	Participating in school sports	450	40,18	8,26		
	Total	870				
Push-ups (number)	Not participating in school sports	420	5,47	3,26	1.31	0,000*
	Participating in school sports	450	12,32	6,59		
	Total	870				
Sit-ups (count)	Not participating in school sports	420	12,79	6,57	1.28	0,000*
	Participating in school sports	450	24,83	11,22		
	Total	870				
Sit-and-Reach Flexibility Test (cm)	Not participating in school sports	420	21,54	4,43	1.48	0,000*
	Participating in school sports	450	27,93	4,30		
	Total	870				
20 Meter Run (sec)	Not participating in school sports	420	4,27	0,31	1.77	0,000*
	Participating in school sports	450	3,68	0,35		
	Total	870				
Agility (s)	Not participating in school sports	420	9,64	3,98	1.18	0,013*
	Participating in school sports	450	6,28	0,46		
	Total	870				

Vertical Jump (cm)	Not participating in school sports	420	21,99	3,86	1.51	0,000*
	Participating in school sports	450	29,11	5,54		
	Total	870				
Arm Strength (Distance-Meters)	Not participating in school sports	420	6,31	1,60	1.18	0,000*
	Participating in school sports	450	8,50	2,10		
	Total	870				

Height: No significant difference between groups ($p = 0,305$). No difference in height was observed between students participating in school sports and those not participating in school sports. This indicates that school sports do not affect height.

Weight: A significant difference exists ($p = 0,022$). Students participating in school sports weigh less than those not participating in school sports (participating in school sports = $\bar{x} 40,18 \pm s.d 8,26$, not participating in school sports = $\bar{x} 42,53 \pm s.d 9,24$). This finding indicates an association between sports participation and lower body weight

Push-ups: A significant difference exists ($p = 0,000$). Students participating in school sports do significantly more push-ups than those not participating in school sports (participating in school sports = $\bar{x} 12,32 \pm s.d 6,59$, not participating in school sports = $\bar{x} 5,47 \pm s.d 3,26$). Students participating in school sports demonstrated higher upper-body strength performance

Sit-ups: There is a significant difference ($p = 0,000$). Those who do sports do significantly more crunches than those who do not (participating in school sports = $\bar{x} 24,83 \pm s.d 11,22$, not participating in school sports = $\bar{x} 12,79 \pm s.d 6,57$). The results indicate an association between sports participation and higher abdominal muscular endurance

Sit-and-Reach Flexibility Test (cm): There is a significant difference ($p = 0,000$). Students who do sports cover more distance than those who do not (participating in school sports = $\bar{x} 27,93 \pm s.d 4,30$, not participating in school sports = $\bar{x} 21,54 \pm s.d 4,43$). This shows that school sports have a positive effect on increasing flexibility and reach.

20 Meter Run: There is a significant difference ($p = 0,000$). Those who participate in school sports run 20 meters faster (participants = $\bar{x} 3,68 \pm s.d 0,35$, non-participants = $\bar{x} 4,27 \pm s.d 0,31$). This means that sports improve cardiovascular capacity and have a positive effect on speed.

Agility: A statistically significant difference was found between the groups regarding agility performance ($p=0.013$). Students participating in school sports demonstrated a significantly lower completion time in the agility test compared to their non-participating peers.

This result indicates that participation in school sports is associated with better change-of-direction ability and agility performance among students.

Vertical Jump: There is a significant difference ($p = 0,000$). Students who participate in school sports perform much higher vertical jumps than those who do not participate. (participants = $\bar{x}$ 29,11 $\pm$ s.d 5,54, non-participants = $\bar{x}$ 21,99 $\pm$ s.d 3,86). It can be said that sports participation was associated with better lower-extremity explosive power performance.

Arm Strength (Distance - Meters) There is a significant difference ($p = 0,000$). Students participating in school sports are stronger than those who do not participate (participating in school sports = $\bar{x}$ 8,50 $\pm$ s.d 2,10, not participating in school sports = $\bar{x}$ 6,31 $\pm$ s.d 1,60). This demonstrates the higher arm strength performance was observed among students participating in school sports.

Table 2. Mann–Whitney U test results and effect size estimates for variables showing non-parametric distributions.

Variable	Mann-Whitney U	Rank Average	Rank Top	Median	Effect size (r)	p value
Push-ups (number)	3258,0	93,77	13128,0	5.0	0.55	0,000*
Sit-ups (number)	3714,5	97,03	13584,5	12.0	0.58	0,000*
Sit-and-Reach Flexibility Test (cm)	3087,5	92,55	12957,5	22.0	0.50	0,000*
20 m Run (sec)	1427,5	210,3	29442,5	4.3	0.59	0,000*
Agility (sec)	2361,0	203,64	28509	9.5	0.48	0,000*
Vertical Jump (cm)	2982,0	91,8	12852	22.0	0.57	0,000*
Arm Strength (Distance-Meters)	4475,0	102,46	14345	6.0	0.52	0,000*

A Mann-Whitney U test was performed to evaluate the differences in anthropometric indices and physical fitness parameters between the groups. The statistical analysis revealed highly significant variations across almost all parameters, except for linear somatic growth.

In terms of health-related physical fitness and motor performance batteries, the analysis demonstrated a distinct and highly significant differentiation ($p < 0.001$) across all functional tests. The Mann–Whitney U test results showed statistically significant differences with large effect sizes across the measured physical performance parameters ($U = 3258.0$, $p = 0.000$) and Sit-ups ($U = 3714.5$, $p = 0.000$). Similarly, flexibility characteristics via the Sit-and-Reach Flexibility Test (cm) ($U = 3087.5$, $p = 0.000$), velocity dynamics via the 20 m Run ($U = 1427.5$, $p = 0.000$), change-of-direction ability via the Agility test ($U = 2361.0$, $p = 0.000$), lower-body explosive power via the Vertical Jump ($U = 2982.0$, $p = 0.000$), and upper-extremity capacities via Arm Strength ($U = 4475.0$, $p = 0.000$) were all significantly influenced by the grouping

factor. These findings suggest that school sports participation is associated with more favorable biomotor performance profiles.

DISCUSSION and CONCLUSION

The findings demonstrate that participation in school sports is associated with better performance in strength, speed, explosive power, flexibility, and agility among middle school students. In addition, the lower body weight observed among students participating in school sports is consistent with the beneficial role of regular physical activity in reducing obesity risk (Sevim & Arslan, 2020). The observed differences in flexibility and agility suggest an association between participation in school sports and enhanced neuromuscular coordination, mobility, and overall motor performance. However, the lack of gymnasiums in approximately 83% of schools remains a major structural barrier that may limit opportunities for students' physical development and participation in quality school sports programs.

In this research, the association between participation in school sports and the anthropometric characteristics and physical performance parameters of middle school students was examined, and the findings were discussed in light of the literature.

One of the most striking findings of the present study was the absence of a significant difference in height between students who participated in school sports and those who did not ($p > 0.05$). This finding is consistent with the view that, although physical activity has been associated with bone development and growth during childhood and adolescence, height is primarily influenced by genetic factors and hormonal regulation. Previous studies by Demir and Özdemir (2022) and Aydoğan et al. (2020) likewise suggest that genetic inheritance is the principal determinant of attained height, while participation in sports may be associated with growth during this developmental period. Similarly, Theintz et al. (1993) reported that participation in sports during adolescence may be associated with growth-related changes, although these associations may not persist over time. Therefore, the absence of a significant difference in height observed in the present study suggests that participation in school sports was not associated with differences in height in this sample.

The significant difference in body weight ($p = 0.022$) in favor of the sports group indicates an association between participation in school sports and lower body weight among middle school students. This finding is consistent with previous studies by Sevim and Arslan (2020) and Erdoğan and Çetin (2021), which suggest that regular physical activity is associated with more favorable body composition and a lower risk of obesity. Therefore, participation in school

sports may represent an important factor related to healthier body weight profiles among adolescents.

When performance tests were examined, students participating in school sports demonstrated statistically higher performance in push-ups, sit-ups, vertical jump, and arm strength values compared with non-participants ($p = 0.001$). Higher scores in push-up and sit-up tests suggest an association between sports participation and greater levels of muscular endurance and motor performance. Similarly, the difference observed in the vertical jump test indicates that participation in school sports is associated with higher lower-extremity explosive power performance. Smith and Johnson (2020) reported that plyometric and resistance exercises are related to improvements in strength-related outcomes through increased neuromuscular activation in young populations. Furthermore, the significant differences observed between the groups in flexibility (sit-and-reach) and agility tests ($p < 0.05$) indicate an association between sports participation and multiple dimensions of physical performance. These findings may be related to differences in training exposure, movement experiences, and neuromuscular characteristics among students participating in school sports. Consistent with the factors highlighted by Cortis et al. (2018), regular physical activity appears to be associated with the development of motor abilities such as agility and flexibility. In contrast to the perspective discussed by Mayorga-Vega et al. (2014), the present findings suggest that students participating in sports branches involving activities such as football and basketball demonstrate better flexibility and agility performance. Overall, this study indicates that participation in school-based sports is associated with more favorable physical performance profiles among middle school students.

1. Relationship Between Performance and Sports: The higher performance observed among students who regularly participate in sports in strength ($p=0.000$), speed ($p=0.000$), and explosive power ($p=0.000$) parameters is consistent with previous studies in the literature (Mutlu-Bozkurt, 2024; Aksoy, 2018). Participation in school sports is associated with higher levels of motor performance and may support the development of motor skills and coordination.
2. Gender Differences: The higher performance of male students in strength and speed tests may be related to biological maturation processes and differences in physical activity patterns among adolescents. The absence of significant gender differences in flexibility and height parameters suggests that these characteristics may be less influenced by sex-related developmental differences during the middle school period

3. **Socio-Economic Synthesis:** It is noteworthy that students from families living in urban areas and relatively lower-income groups demonstrated higher performance in physical tests. This finding may be related to differences in access to sports opportunities, daily activity patterns, and environmental factors. The higher performance observed among students whose mothers had lower educational levels may reflect variations in opportunities for unstructured physical activities, such as outdoor games and active play. However, further studies are needed to clarify the factors underlying these associations.
4. **Recommendations:** The absence of gymnasiums in approximately 83% of schools may represent a major limitation for providing adequate opportunities to enhance students' physical performance. Physical development should not be restricted to physical education classes alone; therefore, expanding school sports programs and improving school infrastructure may provide additional opportunities for students' participation in physical activities.

The statistical analysis revealed significant differences in physical performance parameters between students participating in school sports and those not participating. Normality tests required the use of both parametric and non-parametric approaches. Consistent with the T-test findings for normally distributed somatic data, the Mann-Whitney U test indicated that participation in school sports was associated with higher motor performance ($p < 0.005$). The higher performance observed in push-ups, sit-ups, agility, and explosive power suggests that structured school sports participation is associated with more favorable adolescent biomotor performance profiles, although further longitudinal studies are needed to clarify causal relationships.

This study has several limitations. First, convenience sampling was used, which may have introduced selection bias and may limit the generalizability of the findings to all middle school students. Second, because of the cross-sectional design, causal relationships between school sports participation and physical performance outcomes cannot be established. Third, potential confounding variables, such as nutritional habits, socioeconomic conditions, extracurricular physical activity levels, maturation status, and previous sports experience, were not fully controlled. Future longitudinal studies using representative sampling approaches are recommended to clarify these relationships.

Suggestions

1. Institutional and Strategic Planning (Ministry of National Education and Ministry of Youth and Sports)

Accessibility and Diversity: The Ministry of National Education should promote broader access to school sports opportunities for all students and diversify physical education programs to support the development of various physical abilities, including flexibility, agility, strength, and coordination, in accordance with students' developmental needs.

Integration and Infrastructure: The Ministry of Youth and Sports may develop initiatives that encourage physical activity beyond school hours and facilitate more effective use of existing sports facilities by young people. Greater coordination between training programs and school sports activities may help strengthen students' participation opportunities.

Inclusive Model: The School Sports Department may consider developing an inclusive organizational model that emphasizes both participation and competition, ensuring that students have opportunities to engage in a variety of sports branches.

2. Local Government and School-Based Implementations

Monitoring and Support: Provincial and District Directorates of National Education may consider developing guidelines to increase participation in school sports and support monitoring of implementation processes. Schools with limited physical facilities (e.g., halls and fields) may be prioritized in terms of infrastructure development, equipment provision, and resource allocation.

Individual Monitoring and Personalized Development: School administration and physical education teachers may monitor students' physical development through periodic assessments (e.g., Eurofit tests). Based on assessment results, individualized exercise recommendations may be developed to address students' specific physical needs and abilities.

Non-Competitive Activities: In addition to performance-oriented sports, school sports clubs may organize recreational and health-oriented activities without competitive pressure to encourage participation among students with different levels of interest and ability.

The School Sports model in Türkiye has a centralized and pyramidal structure involving cooperation between the Ministry of National Education (MEB) and the Ministry of Youth and Sports (GSB), with objectives that include talent identification and athlete development. This structure may be associated with a stronger emphasis on competition and performance-oriented

practices compared with broader participation-based approaches. The socio-economic findings of the present study indicate that students living in urban areas and belonging to middle- and lower-income groups demonstrated higher physical test scores. These findings may be related to differences in opportunities for daily physical activity, access to sports participation, and environmental factors. Further research is needed to clarify the mechanisms underlying these associations.

Table 3. Comparative Analysis of the Current Model with International School Sports Models: Conceptual Similarities and Divergences

Country/System	Model Structure:	Comparison with	Research Findings
Türkiye's (Ministry of National Education-Ministry of Youth and Sports)	Centralized, Pyramidal	Elite Athlete/Performance	Infrastructure is inadequate, preventing the widespread development of coordinative skills (agility); however, it creates equal opportunities for lower socioeconomic groups.
ABD (NCAA/High School)	School-based, club-oriented,	Highly Competitive / Scholarship-	Due to excellent financial resources and facilities, agility and speed scores show branch-specific variations, and socio-economic disparities are more pronounced.
The Scandinavian Model	Local Club-School Integration	Lifelong Sport Participation	Performance anxiety is low; physical literacy is prioritized. Motor skills (flexibility/agility) develop homogeneously at an early age, regardless of background.

When compared with international school sports typologies, the findings of the present study highlight potential structural and contextual differences in school sports systems. Previous studies by Akgün (2022) and Kara (2025) suggest that the pyramidal structure of school sports in Türkiye places considerable emphasis on talent identification and the development of athletes with elite performance potential, rather than focusing solely on broad-based physical literacy. This approach may differ from the school sports model observed in the United States (Bowen & Greene, 2012), where greater availability of financial resources and

sports facilities may provide students with diverse opportunities for physical activity and sport-specific skill development.

Similarly, the "Sport for All" approach observed in Scandinavian countries (Green et al., 2015) emphasizes participation and inclusive physical activity opportunities, which may be associated with the development of various motor abilities, including flexibility and agility. Previous research on school-based fitness trends and Eurofit assessments (Lang et al., 2018) suggests that environmental factors, including access to appropriate facilities, may be related to differences in adolescent physical performance outcomes.

In the present study, students participating in school sports demonstrated significantly better agility performance compared with non-participants ($p = 0.013$), as well as superior performance in other motor parameters. These findings suggest that school sports participation is associated with more favorable motor performance profiles; however, further longitudinal research is needed to clarify the potential contribution of environmental and training-related factors to motor skill development.

3. Family and Community Awareness

Parent Seminars: The Ministry of National Education may organize regular seminars for parents to raise awareness about the potential associations between sports participation and various aspects of child development, including physical, cognitive, and academic outcomes.

Lifelong Activity: Parents may be encouraged to support their children's engagement in regular physical activity during leisure time outside of school and to promote balanced lifestyle habits, including appropriate screen time management.

General Evaluation and Conclusion

The findings of this study indicate that participation in school sports is associated with better performance in physical fitness parameters, particularly muscular strength, endurance, explosive power, flexibility, agility, and more favorable body weight profiles among middle school students. These results suggest that school sports programs may provide opportunities to support multidimensional motor development. However, further research with longitudinal designs is needed to clarify the potential long-term contributions of school sports participation to physical and developmental outcomes. Therefore, integrating sports as a complementary component of school education may represent an important approach for promoting healthy lifestyles and physical development among future generations.

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