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Effectiveness of Physical Education in Developing Fundamental Motor Competencies and Their Relationship with Gender and Extracurricular Physical Activity among Fourth- and Fifth-Grade Primary School Pupils (Aged 8–12 Years)

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Abstract : The present study aimed to examine the effectiveness of physicaleducation in developing fundamental motor competencies and to investigate their relationship with gender and participation in extracurricular physical activity among fourth- and fifth-grade primary school pupils (aged 8–12 years) in the Sidi Chahmi district. A comparative descriptive research design was adopted, involving a purposive sample of 108 pupils. Data were collected using a battery of physical and motor performance tests assessing speed, muscular strength, flexibility, and balance.

The findings revealed that physical education contributed significantly to the development of muscular strength and balance, whereas no statistically significant effects were observed for speed or flexibility. Significant gender differences were found in favor of boys regarding speed and muscular strength. Furthermore, participation in extracurricular physical activity had a positive effect on speed, muscular strength, and balance. The study recommends increasing the integration of flexibility and stretching exercises into physical education lessons and encouraging pupils to engage in regular physical activity outside school to further promote the development of fundamental motor competencies.

Keywords: Physical education; Fundamental motor competencies; Gender; Extracurricular physical activity; Primary education

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1. INTRODUCTION

Late childhood is a critical period for the development of fundamental motor competencies, as biological growth stabilizes and the nervous system reaches a level of maturity that facilitates motor learning and skill acquisition (Ben Hafidh, 2021/2022; Bouabdallah & Majidi, 2017). Fundamental motor competencies, including running, jumping, throwing, and balancing, form the basis for children's future physical performance, sports participation, and daily functional movement (Mezyou & Bezyou, 2020). Their development is associated not only with physical fitness but also with cognitive, psychological, and social well-being (Khinche, 2017/2018).

School physical education provides children with structured opportunities to develop these competencies. However, the limited instructional time available in school settings may be insufficient to meet children's developmental needs. Consequently, participation in extracurricular physical activity offers additional opportunities for practice, skill refinement, and physical development (Farhaoui, 2011). Furthermore, motor competence is influenced by biological factors such as gender, which has been associated with differences in motor performance during childhood (Ben Hafidh, 2021/2022; Bouabdallah & Majidi, 2017).

Although previous studies have examined the effects of physical education, gender, and extracurricular physical activity separately, limited evidence is available regarding their combined relationship with fundamental motor competencies among Algerian primary school pupils. Therefore, this study aimed to evaluate the effectiveness of physical education in developing fundamental motor competencies and to examine their relationship with gender and participation in extracurricular physical activity among fourth- and fifth-grade primary school pupils aged 8–12 years.

1.1 Statement of the Problem

Late childhood, particularly among fourth- and fifth-grade primary school pupils, represents a critical period for the development of fundamental motor competencies, which underpin later physical performance, sports participation, and daily functional movement. Although physical education aims to enhance these competencies, noticeable differences in pupils' motor performance suggest that additional factors, such as gender and participation in extracurricular physical activity, may influence motor development.

Previous research has reported significant gender differences in physical activity levels and motor performance, generally favoring boys (Hachaichi Abdelwahab,

2020). Likewise, participation in extracurricular physical activity has been associated with improvements in physical, cognitive, and psychological development (Charfi et al., 2018), while structured motor programs have been shown to enhance children's fundamental motor skills (Hebat Allah Iman & Alouane Rafik, 2025). However, evidence remains limited regarding the combined influence of school physical education, gender, and extracurricular physical activity on the development of fundamental motor competencies among Algerian primary school pupils. Therefore, this study addresses the following research question.

1.2 Research Questions

-Are there statistically significant differences in **speed** according to gender and participation in extracurricular physical activity?

-Are there statistically significant differences in **muscular strength** according to gender and participation in extracurricular physical activity?

-Are there statistically significant differences in **flexibility** according to gender and participation in extracurricular physical activity?

Are there statistically significant differences in **balance** according to gender and participation in extracurricular physical activity?

1.3 Research Hypotheses

H1. There are statistically significant differences in **speed** according to gender and participation in extracurricular physical activity.

H2. There are statistically significant differences in **muscular strength** according to gender and participation in extracurricular physical activity.

H3. There are statistically significant differences in **flexibility** according to gender and participation in extracurricular physical activity.

H4. There are statistically significant differences in **static and dynamic balance** according to gender and participation in extracurricular physical activity.

1.4 Research Objective

The present study aims to:

-Determine whether statistically significant differences exist in **speed** according to gender and participation in extracurricular physical activity.

-Determine whether statistically significant differences exist in **muscular strength** according to gender and participation in extracurricular physical activity.

-Determine whether statistically significant differences exist in **flexibility** according to gender and participation in extracurricular physical activity.

-Determine whether statistically significant differences exist in **static and dynamic balance** according to gender and participation in extracurricular physical activity.

3. Materials and Methods

3.1 Participants

The study included 108 fourth- and fifth-grade pupils (aged 8–12 years) purposively selected from Omar Ben Abdelaziz Primary School in the Sidi Chahmi educational district, Oran, Algeria, during the 2025–2026 academic year. The participants were drawn from a target population of 571 pupils enrolled in primary schools within the same educational district.

3.2. Research Setting

The study was conducted at Omar Ben Abdelaziz Primary School in the Sidi Chahmi educational district, Oran, Algeria, during the 2025–2026 academic year. Data collection was preceded by the development of the research instruments in January 2026 and a pilot study conducted from 10 to 20 January 2026. The questionnaire and the physical and motor assessments were subsequently administered in February 2026.

4. RESULTS

Comparison of Pre-test and Post-test Scores for Physical Fitness Components Following the Implementation of the Physical Education Program Approved by the Ministry of Education

Table 1. Comparison of pre-test and post-test scores for physical fitness components following the implementation of the Ministry of Education's physical education program.

Test	Measurement	Mean	SD	*t*-value	*t*-critical	*p*	df	Statistical Significance
Speed	Pre-test	4.38	0.54	1.72	1.98	0.05	107	Not significant
	Post-test	4.34	0.54					
Muscular Strength	Pre-test	129.20	26.24	4.30	1.98	0.05	107	Significant
	Post-test	133.81	26.04					
Flexibility	Pre-test	0.58	5.96	0.97	1.98	0.05	107	Not significant
	Post-test	0.87	5.92					
Balance	Pre-test	2.37	0.93	5.24	1.98	0.05	107	Significant
	Post-test	2.58	0.79					

The results presented in Table 1 indicate that the Ministry of Education's physical education program had differential effects on the assessed physical fitness components. Significant improvements were observed in muscular strength ($t = 4.30$, $p < .05$) and balance ($t = 5.24$, $p < .05$), with higher post-test scores compared with the pre-test. In contrast, no significant changes were found in speed ($t = 1.72$, $p > .05$) or flexibility ($t = 0.97$, $p > .05$). These findings suggest that the physical education program was effective in enhancing muscular strength and balance but had no measurable impact on speed or flexibility during the study period.

Comparison of Baseline Physical Fitness Components Between Boys and Girls

Table 2 Comparison of baseline physical fitness components between boys and girls.

Test	Group	Mean	SD	*t*-value	*t*-critical	*p*	df	Statistical Significance
Speed	Girls	4.58	0.51	4.27	1.98	0.05	106	Significant
	Boys	4.16	0.49					
Muscular Strength	Girls	117.12	21.38	5.77	1.98	0.05	106	Significant
	Boys	142.71	24.69					
Flexibility	Girls	1.15	5.89	1.05	1.98	0.05	106	Not significant
	Boys	–0.06	6.02					
Balance	Girls	1.32	5.66	0.83	1.98	0.05	106	Not significant
	Boys	0.37	6.20					

The results presented in Table 2 indicate significant baseline gender differences in selected physical fitness components. Boys performed significantly better than girls in speed ($t = 4.27$, $p < .05$) and muscular strength ($t = 5.77$, $p < .05$). In contrast, no significant gender differences were observed in flexibility ($t = 1.05$, $p > .05$) or balance ($t = 0.83$, $p > .05$). These findings suggest that, prior to the implementation of the physical education program, boys demonstrated superior performance in speed and muscular strength, whereas flexibility and balance were comparable between the two groups.

Comparison of Pre-test and Post-test Physical Fitness Components Among Boys Following the Implementation of the Ministry of Education Physical Education Program

Table 3. Comparison of pre-test and post-test physical fitness components among boys following the implementation of the Ministry of Education physical education program.

Test	Measurement	Mean	SD	*t*-value	*t*-critical	*p*	df	Statistical Significance
Speed	Pre-test	4.16	0.49	1.11	2.01	0.05	50	Not significant
	Post-test	4.13	0.50					
Muscular Strength	Pre-test	141.70	23.86	3.30	2.01	0.05	50	Significant
	Post-test	147.00	23.56					
Flexibility	Pre-test	–0.06	6.02	1.01	2.01	0.05	50	Not significant
	Post-test	0.37	6.20					
Balance	Pre-test	2.61	0.77	2.34	2.01	0.05	50	Significant
	Post-test	2.73	0.69					

The results presented in Table 3 indicate that the Ministry of Education's physical education program produced significant improvements in muscular strength ($t = 3.30$, $p < .05$) and balance ($t = 2.34$, $p < .05$) among boys. In contrast, no significant changes were observed in speed ($t = 1.11$, $p > .05$) or flexibility ($t = 1.01$, $p > .05$) between the pre-test and post-test assessments. These findings suggest that the program was effective in enhancing muscular strength and balance in boys but did not produce measurable improvements in speed or flexibility during the intervention period.

Comparison of Pre-test and Post-test Physical Fitness Components Among Girls Following the Implementation of the Ministry of Education Physical Education Program

Table 4. Comparison of pre-test and post-test physical fitness components among girls following the implementation of the Ministry of Education physical education program.

Test	Measurement	Mean	SD	*t*-value	*t*-critical	*p*	df	Statistical Significance
Speed	Pre-test	4.58	0.51	1.31	2.00	0.05	56	Not significant
	Post-test	4.53	0.52					
Muscular Strength	Pre-test	117.12	21.38	2.77	2.00	0.05	56	Significant
	Post-test	121.19	20.69					
Flexibility	Pre-test	1.15	5.89	0.39	2.00	0.05	56	Not significant
	Post-test	1.32	5.66					
Balance	Pre-test	2.15	1.00	4.93	2.00	0.05	56	Significant

	Post-test	2.44	0.85					

The results presented in Table 4 indicate that the Ministry of Education's physical education program significantly improved muscular strength ($t = 2.77$, $p < .05$) and balance ($t = 4.93$, $p < .05$) among female pupils. In contrast, no significant changes were observed in speed ($t = 1.31$, $p > .05$) or flexibility ($t = 0.39$, $p > .05$) between the pre-test and post-test assessments. These findings indicate that the program effectively enhanced muscular strength and balance in girls but did not produce significant improvements in speed or flexibility during the intervention period.

Comparison of Post-test Physical Fitness Components Between Boys and Girls

Table 5. Comparison of post-test physical fitness components between boys and girls.

Test	Group	Mean	SD	*t*-value	*t*-critical	*p*	df	Statistical Significance
Speed	Girls	4.53	0.52	4.04	1.98	0.05	106	Significant
	Boys	4.13	0.50					
Muscular Strength	Girls	121.19	20.69	6.18	1.98	0.05	106	Significant
	Boys	147.96	24.31					
Flexibility	Girls	1.32	5.66	0.83	1.98	0.05	106	Not significant
	Boys	0.37	6.20					
Balance	Girls	2.44	0.85	1.96	1.98	0.05	106	Not significant
	Boys	2.73	0.69					

The results presented in Table 5 indicate significant post-test gender differences in selected physical fitness components. Boys performed significantly better than girls in speed ($t = 4.04$, $p < .05$) and muscular strength ($t = 6.18$, $p < .05$). In contrast, no significant gender differences were observed in flexibility ($t = 0.83$, $p > .05$) or balance ($t = 1.96$, $p > .05$). These findings suggest that, following the implementation of the physical education program, boys maintained superior performance in speed and muscular strength, whereas flexibility and balance remained comparable between boys and girls.

Comparison of Baseline Physical Fitness Components Between Pupils Participating and Not Participating in Extracurricular Sports Activities

Table 6. Comparison of baseline physical fitness components between pupils participating and not participating in extracurricular sports activities.

Test	Group	Mean	SD	*t*-value	*t*-critical	*p*	df	Statistical Significance
Speed	Participants	4.11	0.44	4.24	1.98	0.05	106	Significant
	Non-participants	4.54	0.54					
Muscular Strength	Participants	144.41	25.52	5.27	1.98	0.05	106	Significant
	Non-participants	119.90	22.14					
Flexibility	Participants	0.96	5.42	0.52	1.98	0.05	106	Not significant
	Non-participants	0.34	6.29					
Balance	Participants	2.90	0.35	5.21	1.98	0.05	106	Significant
	Non-participants	2.04	1.02					

The results presented in Table 6 indicate significant baseline differences between pupils who participated in extracurricular physical activity and those who did not. Participants demonstrated significantly better performance in speed ($t = 4.24$, $p < .05$), muscular strength ($t = 5.27$, $p < .05$), and balance ($t = 5.21$, $p < .05$). In contrast, no significant difference was observed in flexibility ($t = 0.52$, $p > .05$). These findings suggest that pupils engaged in extracurricular physical activity exhibited higher levels of physical fitness than their non-participating peers prior to the implementation of the physical education program.

Comparison of Pre-test and Post-test Physical Fitness Components Among Pupils Participating in Extracurricular Sports Activities

Table 7. Comparison of pre-test and post-test physical fitness components among pupils participating in extracurricular sports activities.

Test	Measurement	Mean	SD	*t*-value	*t*-critical	*p*	df	Statistical Significance
Speed	Pre-test	4.11	0.44	2.95	2.02	0.05	40	Significant
	Post-test	4.05	0.46					
Muscular Strength	Pre-test	144.41	25.52	3.68	2.02	0.05	40	Significant
	Post-test	150.59	24.87					
Flexibility	Pre-test	0.96	5.42	1.55	2.02	0.05	40	Not significant
	Post-test	1.66	5.60					
Balance	Pre-test	2.90	0.35	2.03	2.02	0.05	40	Significant
	Post-test	2.97	0.16					

The results presented in Table 7 indicate that pupils who participated in extracurricular physical activity exhibited significant improvements in speed ($t = 2.95$, $p < .05$), muscular strength ($t = 3.68$, $p < .05$), and balance ($t = 2.03$, $p < .05$) following the implementation of the physical education program. In contrast, no significant improvement was observed in flexibility ($t = 1.55$, $p > .05$). These findings suggest that the combined effect of school physical education and extracurricular physical activity contributed to enhancing speed, muscular strength, and balance, whereas flexibility remained unchanged.

Comparison of Pre-test and Post-test Physical Fitness Components Among Pupils Not Participating in Extracurricular Sports Activities

Table 8. Comparison of pre-test and post-test physical fitness components among pupils not participating in extracurricular sports activities.

Test	Measurement	Mean	SD	*t*-value	*t*-critical	*p*	df	Statistical Significance
Speed	Pre-test	4.54	0.54	0.79	2.00	0.05	66	Not significant
	Post-test	4.51	0.52					
Muscular Strength	Pre-test	119.90	22.14	2.64	2.00	0.05	66	Significant
	Post-test	123.55	21.04					
Flexibility	Pre-test	0.34	6.29	0.11	2.00	0.05	66	Not significant
	Post-test	0.39	6.09					

Balance	Pre-test	2.04	1.02	5.03	2.00	0.05	66	Significant
	Post-test	2.33	0.92					

The results presented in Table 8 indicate that pupils who did not participate in extracurricular physical activity showed significant improvements in muscular strength (t = 2.64, p < .05) and balance (t = 5.03, p < .05) following the implementation of the physical education program. However, no significant changes were observed in speed (t = 0.79, p > .05) or flexibility (t = 0.11, p > .05). These findings suggest that, although the physical education program enhanced muscular strength and balance among non-participating pupils, it had no measurable effect on speed or flexibility during the study period.

Comparison of Post-test Physical Fitness Components Between Pupils Participating and Not Participating in Extracurricular Sports Activities

Table 9. Comparison of post-test physical fitness components between pupils participating and not participating in extracurricular sports activities.

Test	Group	Mean	SD		*t*-value	*t*-critical	*p*	df	Statistical Significance
Speed	Participants	4.05	0.46		4.67	1.98	0.05	106	Significant
	Non-participants	4.51	0.52						
Muscular Strength	Participants	150.59	24.87		6.04	1.98	0.05	106	Significant
	Non-participants	123.55	21.04						
Flexibility	Participants	1.66	5.60		1.08	1.98	0.05	106	Not significant
	Non-participants	0.39	6.09						
Balance	Participants	2.97	0.16		4.39	1.98	0.05	106	Significant
	Non-participants	2.33	0.92						

The results presented in Table 9 indicate that pupils participating in extracurricular sports activities demonstrated significantly better performance in speed (t = 4.67, p < .05), muscular strength (t = 6.04, p < .05), and balance (t = 4.39, p < .05) than

their non-participating peers. In contrast, no significant difference was observed in flexibility ($t = 1.08$, $p > .05$) between the two groups. These findings suggest that participation in extracurricular sports activities was associated with superior performance in speed, muscular strength, and balance, whereas flexibility remained unaffected.

5. DISCUSSION

5.1. Discussion of the First Hypothesis

The first hypothesis proposed that **significant differences in speed performance would be observed according to gender and participation in extracurricular physical activity**. The findings partially supported this hypothesis. Although the Ministry of Education's physical education program did not produce a statistically significant improvement in speed performance between the pre-test and post-test assessments for the overall sample, significant differences were observed according to gender and extracurricular physical activity.

Specifically, boys consistently outperformed girls in both the pre-test and post-test assessments. In addition, pupils who regularly participated in sports activities outside school achieved significantly better speed performance than their non-participating peers. These findings suggest that while the school-based physical education curriculum contributes to general physical development, its duration and training intensity may be insufficient to produce substantial improvements in speed, a motor ability that depends largely on neuromuscular adaptations and repeated high-intensity practice.

From a physiological perspective, speed performance is strongly influenced by genetic characteristics, particularly the proportion of fast-twitch muscle fibers, neuromuscular coordination, and movement efficiency. These biological characteristics may explain the superior performance observed among boys during late childhood. Furthermore, regular participation in extracurricular sports provides greater training volume, repeated sprint practice, and enhanced motor coordination, which collectively contribute to superior speed development.

The present findings are consistent with those reported by **Merzouki (2017) and Aouinti (2025)**, who identified significant gender differences in fundamental motor performance among primary school children, emphasizing the importance of considering biological characteristics when designing physical education programs. Similarly, **Hachaychi (2020)** reported higher physical activity levels and better

motor performance among boys than girls, highlighting the combined influence of biological and environmental factors on children's physical fitness.

Overall, the results indicate that extracurricular sports participation plays a crucial role in enhancing speed performance beyond the effects achieved through regular school physical education classes, emphasizing the complementary relationship between school-based and community-based physical activity programs.

5.2. Discussion of the Second Hypothesis

The second hypothesis stated that **significant differences in muscular strength would be associated with gender and participation in extracurricular sports activities**. The results fully supported this hypothesis. Significant improvements in muscular strength were observed between the pre-test and post-test assessments, demonstrating the effectiveness of the physical education program in promoting strength development among primary school pupils. Moreover, boys achieved significantly higher strength scores than girls, while pupils participating in extracurricular sports consistently outperformed their non-participating peers.

The observed improvement can be attributed to the characteristics of the physical education curriculum, which incorporates activities such as running, jumping, and throwing that stimulate neuromuscular development and improve muscular force production. Regular exposure to these activities enhances motor unit recruitment and muscular coordination, leading to measurable gains in strength during late childhood.

The superiority of pupils involved in extracurricular sports is likely explained by their greater training frequency, higher exercise volume, and progressive physical loading experienced in sports clubs and community programs. These additional training opportunities complement the school curriculum and accelerate motor development.

These findings agree with the experimental study conducted by **Aït Lounes (2018) and bahlouli (2024)**, which demonstrated that structured and continuous physical activity programs significantly improve children's fundamental motor skills and physical fitness components. Collectively, the evidence suggests that combining school physical education with regular extracurricular sports participation provides the most effective environment for developing muscular strength during the primary school years.

5.3. Discussion of the Third Hypothesis

The third hypothesis proposed that **significant differences in flexibility would be associated with gender and participation in extracurricular physical activity**. The findings did not support this hypothesis. The statistical analyses revealed no significant differences in flexibility between the pre-test and post-test assessments for the overall sample. Similarly, no statistically significant differences were observed between boys and girls or between pupils who participated in extracurricular sports activities and those who did not.

The absence of significant improvement suggests that the physical education program implemented during the study period did not provide sufficient flexibility-specific training to produce measurable adaptations. Unlike muscular strength and balance, flexibility requires regular, systematic stretching exercises of adequate intensity and duration to improve the extensibility of muscles and connective tissues. General physical activities alone are often insufficient to induce meaningful gains in joint range of motion.

Furthermore, flexibility is influenced by several physiological and anatomical factors, including joint structure, muscle elasticity, tendon extensibility, and genetic predisposition. During late childhood (8–12 years), these characteristics tend to remain relatively stable unless children participate in structured stretching or activities specifically designed to enhance flexibility. Consequently, the routine physical education lessons, which primarily emphasized locomotor and game-based activities, were unlikely to generate substantial improvements in this fitness component.

The lack of significant gender differences may also be explained by the similar developmental stage of the participants. Before puberty, boys and girls generally exhibit comparable levels of flexibility, particularly when they receive similar physical education experiences and have comparable levels of habitual physical activity. Likewise, although pupils engaged in extracurricular sports demonstrated slightly higher flexibility scores, the differences were not statistically significant, suggesting that the sports activities practiced outside school did not include sufficient flexibility-oriented exercises to produce measurable advantages.

These findings are consistent with previous research indicating that flexibility is less responsive than other physical fitness components when training programs do not specifically target stretching and joint mobility. In contrast to muscular strength and balance, which improved significantly following the intervention, flexibility

requires specialized exercises incorporated consistently into physical education sessions to achieve significant progress.

Overall, the findings suggest that the current physical education curriculum is effective in improving certain motor competencies but has limited impact on flexibility development. Therefore, incorporating structured stretching routines, mobility exercises, and flexibility-focused activities into every physical education lesson may enhance joint mobility and contribute to a more balanced development of fundamental motor competencies among primary school pupils.

5.4. Discussion of the Fourth Hypothesis

The fourth hypothesis proposed that **significant differences in balance performance would be observed according to gender and participation in extracurricular physical activity**. The findings partially supported this hypothesis. Statistically significant improvements in balance were observed between the pre-test and post-test assessments for the overall sample, as well as for both boys and girls individually. Furthermore, pupils who participated in extracurricular sports activities demonstrated significantly better balance performance than their non-participating peers in both the baseline and post-intervention assessments. However, no statistically significant gender differences were found in either the pre-test or post-test measurements.

The significant improvement in balance following the implementation of the physical education program indicates that the curriculum effectively promotes the development of postural control and motor coordination among primary school pupils. Many activities commonly included in physical education lessons, such as running, jumping, changes of direction, obstacle courses, and coordination exercises, continuously stimulate the vestibular, proprioceptive, and neuromuscular systems that are essential for maintaining static and dynamic balance. Repeated exposure to these movement tasks enhances body control, postural stability, and movement efficiency.

The superior performance of pupils engaged in extracurricular sports activities further highlights the importance of regular physical practice beyond the school environment. Participation in organized sports provides additional opportunities to perform complex motor tasks requiring continuous postural adjustments, spatial orientation, and dynamic body control. These repeated experiences strengthen neuromuscular coordination and improve the integration of sensory information responsible for balance regulation, thereby explaining the significant differences observed between participants and non-participants.

Interestingly, no significant differences were found between boys and girls with respect to balance performance. This finding suggests that balance development during late childhood is relatively independent of gender when children are exposed to comparable learning experiences and physical activity opportunities. Since balance relies primarily on neuromuscular coordination, sensory integration, and motor learning rather than muscular strength alone, both sexes appear capable of achieving similar levels of postural control during this developmental stage.

These findings are consistent with previous research emphasizing the positive influence of structured physical activity on children's motor competence. **Aït Lounes (2018)** reported that systematic motor programs significantly improve balance and other fundamental motor skills among school-aged children. Likewise, **Heba Allah Iman and Alouane Rafik (2025)** demonstrated that structured movement-based educational programs effectively enhance children's motor abilities, including balance and coordination, through regular and progressively organized physical activities.

Overall, the present findings demonstrate that both school-based physical education and regular extracurricular sports participation contribute significantly to the development of balance during late childhood. These results underscore the importance of integrating balance-oriented exercises into physical education curricula while simultaneously encouraging children to engage in organized physical activities outside school. Such a combined approach can maximize postural stability, motor coordination, and overall fundamental motor competence during the primary school years.

6. CONCLUSION

The present study investigated the effectiveness of physical education in developing fundamental motor competencies and examined the influence of gender and extracurricular physical activity among fourth- and fifth-grade primary school pupils aged 8–12 years. Overall, the findings demonstrate that school-based physical education plays a significant role in enhancing children's motor development, although its effectiveness varies across different components of physical fitness.

The results revealed significant improvements in **muscular strength** and **balance** following the implementation of the Ministry of Education's physical education program, whereas **speed** and **flexibility** did not show statistically significant improvements for the overall sample. These findings indicate that the current

curriculum effectively develops motor abilities associated with neuromuscular coordination and muscular performance but provides insufficient training stimuli to optimize speed and flexibility.

The study also identified significant gender differences in **speed** and **muscular strength**, with boys outperforming girls in both variables. In contrast, **flexibility** and **balance** showed no significant differences between boys and girls, suggesting that these motor competencies develop similarly during late childhood when pupils receive comparable educational experiences.

Furthermore, participation in **extracurricular sports activities** emerged as an important determinant of motor competence. Pupils engaged in organized physical activities outside school consistently demonstrated superior performance in **speed**, **muscular strength**, and **balance** compared with their non-participating peers, both before and after the intervention. These findings highlight the complementary role of extracurricular sports in reinforcing and extending the benefits of school physical education.

Taken together, the results emphasize that physical education should not be viewed as an isolated educational subject but rather as a fundamental component of children's holistic development. While the existing curriculum contributes positively to several aspects of motor competence, greater emphasis should be placed on flexibility-oriented exercises and high-intensity movement activities capable of improving speed performance. Moreover, encouraging regular participation in organized physical activity outside school may substantially enhance children's motor development and overall physical fitness.

In conclusion, an integrated approach that combines **high-quality school physical education**, **regular extracurricular sports participation**, and **evidence-based instructional strategies** offers the most effective pathway for developing fundamental motor competencies during late childhood. Such an approach can contribute to improving children's physical fitness, promoting lifelong engagement in physical activity, and supporting healthier developmental outcomes throughout adolescence and adulthood.

7. RECOMMENDATIONS

Based on the findings of this study, the following recommendations are proposed:

- Increase the effectiveness of primary school physical education programs by incorporating a wider variety of activities that target all components of fundamental motor competence.

-Integrate regular flexibility and stretching exercises into each physical education lesson to improve joint mobility and movement efficiency.

-Encourage pupils to participate in organized extracurricular sports activities, as regular participation contributes positively to the development of speed, muscular strength, and balance.

-Design age-appropriate physical education programs that provide progressive opportunities for developing fundamental motor skills in both boys and girls.

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