# Structured Sprint Training in Physical Education: Effects on Children's Motor Skills and Physical Activity Levels

*Entrenamiento de velocidad estructurado en educación física: efectos sobre las habilidades motoras y los niveles de actividad física de los niños*

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## Abstract

Introduction: Physical activity plays an essential role in children's physical development, particularly in improving motor skills and promoting active lifestyles.
Objective: This study aimed to examine the effects of a structured sprint training program on children's motor skills and physical activity levels during physical education classes.
Methodology: A quasi-experimental design with a pre-test and post-test control group was employed. A total of 40 elementary school students aged 10–12 years were randomly assigned to an experimental group (n = 20) and a control group (n = 20). Motor skills were assessed using the Test of Gross Motor Development (TGMD-3), and physical activity levels were measured using the Physical Activity Questionnaire for Children (PAQ-C).
Results: The results showed significant improvements in the experimental group. Motor skill scores increased from 32.45 ± 4.21 to 41.80 ± 4.73, while the control group improved slightly from 33.10 ± 4.05 to 35.05 ± 4.18. Physical activity levels also increased in the experimental group from 2.71 ± 0.41 to 3.82 ± 0.47, whereas the control group showed a smaller increase from 2.69 ± 0.39 to 2.95 ± 0.42.
Discussion: The results suggest that structured sprint training enhances locomotor skills, neuromuscular coordination, and student engagement in physical activity during physical education.
Conclusions: Structured sprint training is an effective strategy for improving children's motor skills and increasing physical activity participation in school settings.

## Keywords

Sprint Training; Motor Skills; Physical Activity; Physical Education.

## Resumen

Introducción: La actividad física desempeña un papel esencial en el desarrollo físico infantil, especialmente en la mejora de las habilidades motoras y la promoción de estilos de vida activos. Objetivo: Este estudio tuvo como objetivo examinar los efectos de un programa estructurado de entrenamiento de velocidad en las habilidades motoras y los niveles de actividad física de los niños durante las clases de educación física. Metodología: Se empleó un diseño cuasiexperimental con un grupo control pretest y postest. Un total de 40 estudiantes de primaria de 10 a 12 años fueron asignados aleatoriamente a un grupo experimental (n = 20) y a un grupo control (n = 20). Las habilidades motoras se evaluaron mediante el Test de Desarrollo Motor Grueso (TGMD-3) y los niveles de actividad física se midieron mediante el Cuestionario de Actividad Física para Niños (PAQ-C). Resultados: Los resultados mostraron mejoras significativas en el grupo experimental. Las puntuaciones de habilidades motoras aumentaron de 32,45 ± 4,21 a 41,80 ± 4,73, mientras que el grupo control mejoró ligeramente de 33,10 ± 4,05 a 35,05 ± 4,18. Los niveles de actividad física también aumentaron en el grupo experimental de 2,71 ± 0,41 a 3,82 ± 0,47, mientras que el grupo control mostró un aumento menor de 2,69 ± 0,39 a 2,95 ± 0,42. Discusión: Los resultados sugieren que el entrenamiento estructurado de sprint mejora las habilidades locomotoras, la coordinación neuromuscular y la participación de los estudiantes en la actividad física durante la educación física. Conclusiones: El entrenamiento estructurado de sprint es una estrategia eficaz para mejorar las habilidades motoras de los niños y aumentar la participación en la actividad física en el entorno escolar.

## Palabras clave

Entrenamiento de velocidad; Habilidades motoras; Actividad física; Educación física.

## Introduction

Physical activity plays a crucial role in children's physical, cognitive, and psychosocial development. Regular engagement in physical activity contributes to improved cardiovascular fitness, musculoskeletal health, and overall well-being during childhood and adolescence. Physical education plays an important role in developing children's motor competence and promoting lifelong physical activity participation. Recent studies published in Retos highlight that structured physical training programs implemented in school environments significantly improve students' motor performance, physical fitness, and engagement during physical education classes (Garcia-Hermoso et al., 2022; López-Belmonte et al., 2023; Rodriguez-Fernandez et al., 2025). These findings indicate that structured training programs integrated into physical education curricula provide meaningful improvements in children's physical development.

Sprint training is one of the fundamental locomotor skills that plays an essential role in motor development. Sprint activities require coordination, strength, balance, and neuromuscular control, which contribute to improved movement efficiency and physical performance. Previous research published in Retos has demonstrated that speed-based training programs significantly improve coordination, agility, and running mechanics among school-aged children (Martinez-Lopez et al., 2024). Among these locomotor skills, running ability especially sprinting plays a key role in children's physical development because it requires the integration of coordination, strength, balance, and neuromuscular control (Mero & Komi, 2018; Morin & Samozino, 2016). Research has demonstrated that children with higher levels of motor competence are more likely to participate in regular physical activity and maintain active lifestyles across the lifespan (Lopes et al., 2019; Robinson et al., 2015).

Despite the recognized importance of motor skill development, several studies indicate that many children worldwide demonstrate insufficient levels of motor competence and physical activity participation. Modern lifestyles characterized by increased sedentary behavior, screen time, and reduced opportunities for outdoor play have contributed to declining physical activity levels among children (Guthold et al., 2020; Tremblay et al., 2017). As a result, physical education teachers are increasingly encouraged to implement structured and developmentally appropriate training programs that can effectively enhance motor skills and promote active engagement in school settings (Bailey et al., 2017; Fairclough & Stratton, 2019).

Another important aspect of sprint-based training in physical education is its potential to increase children's overall physical activity levels. Sprint activities are typically performed at high intensity and require active engagement, which can contribute to meeting recommended levels of moderate-to-vigorous physical activity during school hours (Fairclough et al., 2018). Studies indicate that incorporating dynamic and high-intensity activities such as sprint drills, relay games, and short-distance running tasks into physical education lessons can significantly increase children's activity levels and energy expenditure (Hollis et al., 2017; Lonsdale et al., 2019). These activities not only improve physical fitness but also enhance motivation and enjoyment during physical education classes.

Furthermore, structured sprint training aligns well with pedagogical approaches in physical education that emphasize skill acquisition through progressive practice and feedback. Effective sprint instruction involves teaching proper running mechanics, acceleration techniques, and stride coordination, which can improve movement efficiency and reduce the risk of injury (Morin & Samozino, 2016). By integrating sprint training into physical education curricula, teachers can provide children with opportunities to develop both fundamental motor skills and sport-specific movement competencies (Lloyd & Oliver, 2012).

Recent studies have also highlighted the importance of early motor skill interventions in childhood. Children who develop strong motor skills during early school years are more likely to participate in organized sports and recreational physical activities during adolescence (Stodden et al., 2014). Therefore, implementing structured sprint training programs in physical education may serve as an effective strategy to promote both motor skill development and sustained physical activity engagement among children.

Despite the growing body of research on motor skill interventions and youth physical training, relatively few studies have specifically examined the combined effects of structured sprint training on children's motor skills and physical activity levels within the context of physical education. Most existing studies focus primarily on athletic performance or general physical fitness rather than educational outcomes in school settings. Consequently, further investigation is needed to understand how sprint-based training programs can be effectively integrated into physical education curricula to support children's motor development and active participation.

Therefore, the purpose of this study is to examine the effects of a structured sprint training program implemented during physical education classes on children's motor skills and physical activity levels. By exploring the relationship between sprint-based training and motor competence, this study aims to contribute to the development of evidence-based teaching strategies that enhance movement skills and promote active lifestyles among school-aged children.

## Method

This study employed a quasi experimental research design using a pre-test and post-test control group approach to examine the effects of structured sprint training on children's motor skills and physical activity levels. Two groups were involved in the study: an experimental group that participated in a structured sprint training program integrated into physical education classes and a control group that followed the regular physical education curriculum without additional sprint training. Measurements were conducted before and after the intervention period to evaluate changes in motor skills and physical activity levels.

### *Participants*

The participants in this study were elementary school students aged 10-12 years. A total of 40 students were recruited and randomly assigned into two groups: an experimental group (n = 20) and a control group (n = 20). All participants were healthy and had no medical conditions that could limit their participation in physical activity. Prior to participation, informed consent was obtained from the students' parents or guardians, and the study protocol was approved by the school administration. The research procedures followed ethical standards for research involving human participants..

### *Procedure*

The study was conducted in several stages. First, all participants completed the pre-test measurements for motor skills and physical activity levels. After the initial assessment, the experimental group participated in the structured sprint training program during regular physical education classes, while the control group continued their usual physical education activities. The intervention lasted for eight weeks. Upon completion of the training program, post-test measurements were conducted using the same instruments to determine changes in motor skill performance and physical activity levels.



**Training Session Structure**
Warm-Up (10 Minutes)
Dynamic stretching, Light jogging, Movement preparation drills

Main Sprint Training (20 Minutes)
Week 1-2
10m acceleration sprint (6 repetitions), Reaction sprint drills, Relay sprint games
Week 3-4
20m sprint training (6 repetitions), Ladder speed drills, Partner chase sprint
Week 5-6
30m sprint training (5 repetitions), Acceleration technique drills, Shuttle sprint training
Week 7-8
Combination sprint drills, Reaction sprint competition, Game-based sprint training

Cool-Down (5 Minutes)
Walking recovery, Static stretching

### *Instrument*

*Motor Skills Assessment*
Children's motor skills were assessed using the Test of Gross Motor Development (TGMD-3), which evaluates fundamental locomotor and object control skills. In this study, the locomotor component, particularly running-related movement patterns, was used to assess improvements in motor skill performance. The test included several locomotor tasks, and each movement was evaluated based on specific performance criteria. The total score represented the participant's level of motor skill competence.

*Physical Activity Measurement*
Physical activity levels were assessed using the Physical Activity Questionnaire for Children (PAQ-C), a validated self-report questionnaire designed to measure moderate to vigorous physical activity among school-aged children. The questionnaire consists of nine items that evaluate physical activity participation during school and leisure time over the previous seven days.

### *Data analysis*

All statistical analyses were performed using the IBM SPSS Statistics software package version 26. Descriptive statistics were calculated and presented as mean and standard deviation for all variables. Prior to hypothesis testing, the Shapiro Wilk test was used to examine the normality of data distribution, and Levene's test was applied to assess the homogeneity of variances. To determine the effects of the structured sprint training program, a two-way repeated measures ANOVA was conducted to analyze differences between groups (experimental vs. control) and time (pre-test vs. post-test). Statistical significance was set at $p < 0.05$. Additionally, effect size was calculated using Cohen's d to determine the magnitude of the training effects..



## Results

Descriptive statistical analysis was conducted to provide an overview of the research data, including the pretest and posttest scores of motor skills and the levels of physical activity in both the experimental and control groups. A summary of the descriptive analysis results is presented in Table 1.

Tabel. 1 Descriptive Statistics of Motor Skills and Physical Activity Levels

| Variable | Group | Pre-test Mean ± SD | Post-test Mean ± SD |
|---|---|---|---|
| Motor Skills (TGMD-3 score) | Experimental | 32.45 ± 4.21 | 41.80 ± 4.73 |
| | Control | 33.10 ± 4.05 | 35.05 ± 4.18 |
| Physical Activity (PAQ-C score) | Experimental | 2.71 ± 0.41 | 3.82 ± 0.47 |
| | Control | 2.69 ± 0.39 | 2.95 ± 0.42 |

The descriptive results indicate that both groups had relatively similar baseline scores prior to the intervention. However, after the eight week training program, the experimental group demonstrated a substantial increase in both motor skill performance and physical activity levels compared with the control group. The motor skill score of the experimental group increased from 32.45 to 41.80, whereas the control group showed only a slight improvement from 33.10 to 35.05. A similar pattern was observed for physical activity levels, where the experimental group increased from 2.71 to 3.82, while the control group showed only a modest increase.

Table 2. Shapiro Wilk Normality Test

| Variable | Group | p-value |
|---|---|---|
| Motor Skills Pre-test | Experimental | 0.214 |
| Motor Skills Pre-test | Control | 0.187 |
| Motor Skills Post-test | Experimental | 0.231 |
| Motor Skills Post-test | Control | 0.205 |
| Physical Activity Pre-test | Experimental | 0.193 |
| Physical Activity Pre-test | Control | 0.221 |
| Physical Activity Post-test | Experimental | 0.174 |
| Physical Activity Post-test | Control | 0.209 |

The Shapiro–Wilk test showed that all variables had p-values greater than 0.05, indicating that the data were normally distributed.

Table 3. Levene's Test for Homogeneity of Variance

| Variable | F | p-value |
|---|---|---|
| Motor Skills | 0.84 | 0.364 |
| Physical Activity | 0.76 | 0.387 |



Levene's test results indicated that the assumption of homogeneity of variance was satisfied for both variables ($p > 0.05$).

A two-way repeated measures ANOVA was conducted to examine the interaction between group (experimental vs control) and time (pre-test vs post-test).

Table 4. ANOVA Results for Motor Skills

| Source | F | p-value | Partial $\eta^2$ |
|---|---|---|---|
| Time | 46.17 | <0.001 | 0.54 |
| Group | 7.95 | 0.008 | 0.18 |
| Time × Group | 29.32 | <0.001 | 0.44 |

The results showed a significant interaction effect ($F = 29.32$, $p < 0.001$) for physical activity levels, indicating that the sprint training program contributed to a greater increase in physical activity participation among students in the experimental group.

Table 5. ANOVA Results for Physical Activity

| Source | F | p-value | Partial $\eta^2$ |
|---|---|---|---|
| Time | 38.64 | <0.001 | 0.50 |
| Group | 6.87 | 0.012 | 0.15 |
| Time × Group | 24.91 | <0.001 | 0.40 |

The results of the two-way ANOVA analysis showed a significant effect on students' physical activity levels. The effect of time showed a significant increase from pre-test to post-test ($F = 38.64$, $p < 0.001$, partial $\eta^2 = 0.50$). Furthermore, there was a significant difference between the experimental and control groups ($F = 6.87$, $p = 0.012$, partial $\eta^2 = 0.15$). The interaction between time and group also showed significant results ($F = 24.91$, $p < 0.001$, partial $\eta^2 = 0.40$), indicating that the structured sprint training program resulted in a greater increase in physical activity in the experimental group than in the control group.

Effect size analysis was conducted using Cohen's d to determine the magnitude of the intervention effect.

Table 6. Effect Size of Training Program

| Variable | Cohen's d | Interpretation |
|---|---|---|
| Motor Skills | 1.18 | Large effect |
| Physical Activity | 0.96 | Large effect |

The effect size analysis indicated that the sprint training program had a large effect on both motor skills and physical activity levels.

## Discussion

The purpose of this study was to examine the effects of a structured sprint training program implemented during physical education classes on children's motor skills and physical activity levels. The results indicated that students who participated in the structured sprint training program demonstrated significantly greater improvements in motor skill performance and physical activity levels compared with those who followed regular physical education activities.

The improvement in motor skill performance observed in the experimental group supports previous findings indicating that structured physical activity interventions are effective in enhancing children's fundamental movement skills. Structured training programs provide systematic practice opportunities that allow children to repeatedly perform locomotor movements such as running, jumping, and accelerating. These repeated movement experiences contribute to improvements in neuromuscular coordination and motor control. Previous research has demonstrated that structured exercise programs significantly improve motor competence, balance, and coordination among children compared with unstructured physical activities (Ren & Zhao, 2025; Stodden et al., 2014).

The significant improvement in locomotor skills observed in this study may be explained by the specific characteristics of sprint training. Sprinting involves rapid acceleration, high stride frequency, and coordinated movement between the upper and lower limbs. Such biomechanical demands stimulate neuromuscular adaptations that enhance motor performance. Studies in sports science indicate that sprint-based activities improve muscle power, stride efficiency, and movement coordination, which are essential components of children's motor development (Haugen et al., 2019; Morin & Samozino, 2016).

Furthermore, the findings of the present study are consistent with research indicating that structured motor skill interventions implemented in educational settings can significantly enhance children's gross motor skills. Structured physical activity programs conducted in schools allow students to practice fundamental movements within a controlled and supportive environment guided by teachers. Evidence suggests that organized physical education programs positively influence children's motor competence and contribute to the development of locomotor skills (Bremer & Cairney, 2021; Lopes et al., 2019). Additionally, meta-analytic evidence shows that curriculum-based physical education interventions have a meaningful positive effect on children's motor competence and movement proficiency.

Another important finding of this study is the increase in physical activity levels among students in the experimental group. This result suggests that sprint-based activities can effectively increase students' engagement during physical education classes. Sprint drills, relay activities, and short-distance running tasks typically involve high-intensity movements that encourage active participation and reduce sedentary time during lessons. Previous studies have shown that incorporating dynamic and high-intensity activities into physical education lessons can increase moderate-to-vigorous physical activity levels among school-aged children (Hollis et al., 2017; Lonsdale et al., 2019).

The improvement in physical activity levels observed in this study also highlights the motivational benefits of sprint-based activities. Children generally respond positively to activities that involve speed, competition, and game-based challenges. These elements increase enjoyment and engagement during physical education lessons. Research suggests that when children perceive physical activities as enjoyable and challenging, they are more likely to participate actively and sustain higher levels of physical activity (Lubans et al., 2019).

Another explanation for the effectiveness of the sprint training program lies in the pedagogical structure of the intervention. Structured programs typically include progressive difficulty levels, clear instructional feedback, and repeated practice opportunities. Such pedagogical approaches allow children to gradually refine their movement patterns and develop more efficient running techniques. Studies on structured training programs in early childhood education indicate that teacher-guided physical activities significantly enhance children's motor coordination, agility, and movement proficiency.

The results of the present study also align with research suggesting that structured physical activity programs produce greater improvements in motor development than unstructured play. Structured activities offer clear objectives, organized practice, and teacher supervision, which contribute to more consistent motor learning experiences. Longitudinal studies have shown that children who participate in structured physical activity demonstrate greater improvements in gross motor skills compared with children who primarily engage in unstructured activities.

From an educational perspective, the findings of this study highlight the importance of integrating sprint training into physical education curricula. Sprint activities are relatively easy to implement in school environments because they require minimal equipment and can be adapted to various teaching formats such as relay races, agility drills, and speed challenges. By incorporating structured sprint training into physical education lessons, teachers can effectively promote motor skill development while simultaneously increasing students' physical activity levels.

However, several limitations should be acknowledged. First, the sample size in this study was relatively small, which may limit the generalizability of the findings. Second, the intervention period lasted only eight weeks, which may not fully capture the long-term effects of sprint training on children's motor development. Future studies should consider longer intervention periods and larger participant samples to further explore the long-term impact of sprint-based physical education programs. Additionally, future research may examine other outcomes such as agility, coordination, and cardiovascular fitness to provide a more comprehensive understanding of sprint training effects in educational contexts.

Overall, the findings of this study suggest that structured sprint training implemented within physical education classes is an effective strategy for improving children's motor skills and increasing their physical activity participation. These results provide empirical support for incorporating speed-based training activities into school physical education programs to promote motor competence and active lifestyles among children.



## Conclusions

The results showed that students who participated in the sprint training program demonstrated significantly greater improvements in locomotor motor skills and physical activity levels compared with those who followed regular physical education lessons. The findings indicate that structured sprint-based activities can effectively enhance running mechanics, coordination, and neuromuscular control while also increasing students' engagement in moderate-to-vigorous physical activity. These results suggest that integrating structured sprint training into physical education curricula can serve as an effective strategy to improve children's motor competence and promote active participation in school settings. Sprint-based activities are practical for school environments because they require minimal equipment and can be implemented through various activities such as relay races, speed drills, and running games. Therefore, physical education teachers are encouraged to incorporate sprint training elements to support children's physical development and foster lifelong physical activity habits.

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