High-intensity functional training (HIFT) in primary physical education: a systematic review

Entrenamiento funcional de alta intensidad (HIFT) en la educación física de educación primaria. Una revisión sistemática

Authors

Igor Conde Cortabitarte [1]
David Díaz Tejerina [2]

[1] Consejería de Educación de Cantabria (Spain)
[2] Universidad de Oviedo (Spain)

Corresponding author:
David Díaz Tejerina
diaztdavid@uniovi.es

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Abstract

Introduction: This systematic review examined the available evidence on high-intensity functional training (HIFT), including CrossFit-based interventions, implemented in primary school physical education settings.
Objective: The aim was to synthesize intervention characteristics and explore their effects on physical fitness, physiological load, psychosocial outcomes, and cognitive performance.
Methodology: A systematic search was conducted in PubMed, WOS, Scopus, and Dialnet in October 2025 following PRISMA guidelines. Eligible peer-reviewed studies involving HIFT-based interventions in primary education were included.
Results: Six studies met the inclusion criteria and were included in the qualitative synthesis. The included studies showed substantial heterogeneity in design, duration (single sessions to 12 weeks), and outcome measures.
Discussion: Limited evidence suggests that HIFT-based interventions may be associated with improvements in physical fitness components, particularly muscular strength and cardiorespiratory fitness, and may have positive effects on psychosocial outcomes such as motivation and perceived competence. Evidence regarding cognitive outcomes was inconsistent and remains insufficient. No adverse events were reported; however, the small number of studies and their methodological limitations preclude firm conclusions regarding safety and effectiveness. Due to heterogeneity and limited comparability across studies, meta-analysis was not conducted, and findings should be interpreted with caution.
Conclusion: HIFT-based interventions appear to be a feasible approach for primary school physical education, but the current evidence base is limited and methodologically weak. Further high-quality randomized controlled trials are needed to establish robust conclusions regarding effectiveness and safety.

Keywords

CrossFit; high-intensity functional training; HIFT; elementary school; children.

Resumen

Introducción: Esta revisión sistemática examinó la evidencia disponible sobre el entrenamiento funcional de alta intensidad (HIFT), incluyendo intervenciones basadas en CrossFit, implementadas en el contexto de la educación física en educación primaria.
Objetivo Sintetizar las características de las intervenciones y analizar sus efectos sobre la condición física, la carga fisiológica, las variables psicosociales y el rendimiento cognitivo.
Metodología: Se realizó una búsqueda en PubMed, WOS, Scopus y Dialnet en octubre de 2025 siguiendo las directrices PRISMA. Se incluyeron estudios revisados por pares que implementaban intervenciones basadas en HIFT en educación primaria.
Resultados: Seis estudios cumplieron los criterios de inclusión y fueron incluidos en la síntesis cualitativa. Los estudios incluidos mostraron una heterogeneidad sustancial en el diseño, la duración (desde sesiones únicas hasta 12 semanas) y las medidas de resultado.
Discusión: La evidencia limitada sugiere que las intervenciones basadas en HIFT podrían asociarse con mejoras en componentes de la condición física, especialmente en la fuerza muscular y la capacidad cardiorrespiratoria, así como con posibles efectos positivos en variables psicosociales como la motivación y la percepción de competencia. La evidencia sobre los resultados cognitivos fue inconsistente y resulta insuficiente. No se reportaron eventos adversos; sin embargo, el reducido número de estudios y sus limitaciones metodológicas impiden establecer conclusiones firmes sobre la seguridad y la eficacia de estas intervenciones. Debido a la heterogeneidad y la limitada comparabilidad entre estudios, no se realizó metaanálisis, por lo que los resultados deben interpretarse con cautela.
Conclusiones: En conclusión, las intervenciones basadas en HIFT parecen ser una estrategia factible en el contexto de la educación física en educación primaria, aunque la evidencia actual es limitada y metodológicamente débil. Se requieren ensayos controlados aleatorizados de mayor calidad para establecer conclusiones más sólidas sobre su eficacia y seguridad.

Palabras clave

CrossFit; entrenamiento funcional de alta intensidad; HIFT; educación primaria; niños.

Introduction

Physical activity is a fundamental component of children's holistic development, contributing to physical, cognitive, emotional, and social well-being. International health organizations, including the World Health Organization (2020), recommend that children and adolescents accumulate at least 60 minutes of moderate-to-vigorous physical activity daily to support healthy growth, reduce obesity risk, and promote the development of fundamental motor skills. However, a substantial proportion of children fail to meet these recommendations, highlighting the need for effective and engaging strategies within school-based physical education settings (Chavez Erives et al., 2025; Díaz-Tejerina & Fernández-Río, 2024; Mellado-Rubio, Devís-Devís y Valencia-Peris, 2023; Strain et al., 2024).

In response to this challenge, high-intensity functional training (HIFT) has emerged as a training approach characterized by multi-joint, functional movements performed at relatively high intensities, typically structured in circuit-based or interval formats. CrossFit represents one of the most widely disseminated models of HIFT. Although research in adults and adolescents has reported potential improvements in physical fitness components (Feito et al., 2018; Wang et al., 2023), evidence in younger populations remains limited and requires cautious interpretation.

The application of HIFT in children requires careful consideration of developmental factors, including appropriate load, movement complexity, and progression (Lloyd et al., 2014). From a pedagogical perspective, the variability and functional nature of HIFT may contribute to motor competence development and engagement in physical activity (Myer et al., 2011). However, the high-intensity nature of these interventions also raises concerns regarding their suitability in pediatric populations, particularly in relation to load management and safety, which remain insufficiently established.

Recent research has explored HIFT-based interventions in school physical education, primarily in secondary education contexts (Bento de Moraes Junior et al., 2025; Sánchez-Silva & Lamoneda-Prieto, 2023; Sotelo-Besada & Pizarro-Mateo, 2025). These studies suggest potential benefits for physical fitness and psychosocial outcomes; however, findings are inconsistent and based on heterogeneous study designs, limiting their comparability and generalizability.

A systematic review and meta-analysis by Han et al. (2021) reported improvements in selected physical fitness components following CrossFit-based interventions in school settings, although effects were not consistent across outcomes such as core strength, jumping performance, and body composition. These mixed findings highlight the need for further research to better understand the effectiveness of HIFT-based interventions in educational contexts.

Despite this emerging evidence, research focusing specifically on children aged 6–12 years remains scarce. Existing studies are limited in number and characterized by substantial heterogeneity in design, duration, and outcome measures, often including small sample sizes and non-randomized methodologies. To date, no systematic review has comprehensively synthesized the evidence on HIFT-based interventions within primary school physical education.

Therefore, the present study aims to systematically review the available literature on HIFT in children aged 6–12 years within primary education contexts. The objectives are to: (1) examine intervention characteristics; (2) synthesize effects on physical fitness, physiological load, psychosocial, and cognitive outcomes; and (3) identify implications for educational practice and future research.

Method

This systematic review was conducted and reported in strict adherence to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) (Page et al., 2021) to ensure transparency and replicability. The methodological process is schematized in the PRISMA flow diagram (Figure nº 1).

Eligibility Criteria

Eligibility criteria were established *a priori* based on the Population, Intervention, Comparator, Outcomes, and Study design (PICOS) framework.

Inclusion criteria were:

- Peer-reviewed empirical articles published in English or Spanish.
- Studies that implemented a HIFT-based intervention (including CrossFit).
- Publication period between January 2010 and October 2025.
- The study population consisted of primary school children (ages 6–12 years).
- Studies conducted within a formal educational setting (e.g., physical education classes).

Exclusion criteria were:

- Non-empirical publications (e.g., doctoral dissertations, theses, books, book chapters, editorials, theoretical reviews).
- Grey literature (e.g., conference proceedings, communications, or posters).
- Studies focused on secondary school or university populations.
- Studies conducted outside of a formal educational setting.

Information Sources and Search Strategy

A systematic literature search was finalized in October 2025 across four electronic databases: PubMed, Web of Science, Scopus, and Dialnet. The latter was included to expand the coverage of Spanish-language literature. SPORTDiscus was not included because Scopus and Web of Science already provide broad coverage of sport and exercise science journals, while PubMed was selected to ensure coverage of biomedical literature and Dialnet to capture Spanish-language publications. Nevertheless, the exclusion of SPORTDiscus may have resulted in some relevant studies not being identified.

The search query combined terms for the intervention and the population/setting. The proprietary term "CrossFit" was intentionally included, as it represents the most popularized form of HIFT. This inclusion was methodologically necessary, as many studies use this specific designation without explicitly referring to HIFT; its omission would have limited the scope and comprehensiveness of the review.

The final search string, adapted for each database's syntax, was structured using the Boolean operators "AND" and "OR" as follows: ("CrossFit" OR "high-intensity functional training" OR "HIFT") AND ("primary education" OR "elementary school" OR "physical education" OR "children")

Study Selection

The study selection process followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. All identified records were exported to a reference management system, and duplicates were removed prior to screening. Two independent reviewers screened titles and abstracts according to the predefined eligibility criteria. Full-text articles were subsequently assessed for eligibility, and disagreements were resolved through discussion and consensus. The selection process is presented in the PRISMA flow diagram (Figure nº 1).

Secondary and Grey Literature Search

Following the final selection of the 6 articles, their reference lists were manually screened to identify potential studies not retrieved in the database searches. No additional studies meeting the inclusion criteria were found. A complementary search was also conducted in Google Scholar using the same search terms to identify grey literature. An exhaustive review of the first five pages of results yielded no new relevant studies.

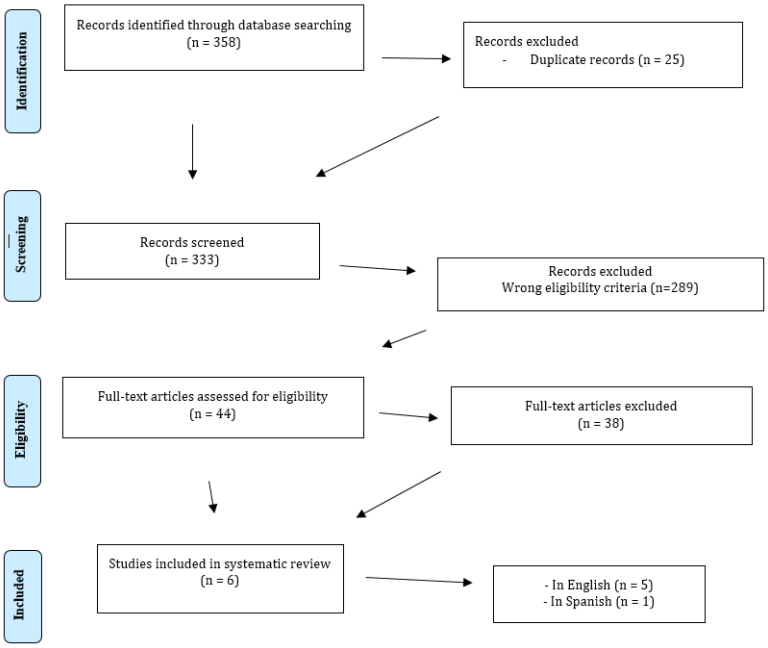
Methodological Quality Assessment

The methodological quality of the included studies was independently assessed by two reviewers (D.D.T. and I.C.C.). Any disagreements were resolved by consensus. Given the heterogeneity of the included study designs, the Joanna Briggs Institute (JBI) Critical Appraisal Checklists were utilized (JBI, 2020). Specific checklists for Randomized Controlled Trials (RCTs) and Quasi-Experimental Studies were applied. Each study was evaluated against the items on its respective checklist, which assess potential biases in design, conduct, and analysis.

As the JBI critical appraisal tools do not provide an overall quality score, an overall methodological quality classification was developed for descriptive purposes based on the pattern of responses across the appraisal items. Studies were classified considering the number of criteria met together with the potential impact of the identified methodological limitations (e.g., lack of randomization, inadequate control of confounding variables, or absence of blinding). This classification was used solely to facilitate interpretation of the findings and was not used as an exclusion criterion.

The results of this assessment were not used to exclude studies, but rather to contextualize the synthesis of findings in the Discussion section.

Figure 1. PRISMA flow diagram illustrating the study selection process.



Source: Adapted from Page et al. (2021).

Results

Study Selection

The systematic search identified 358 records across four databases. After removal of 25 duplicates, 333 unique records were screened by title and abstract. Of these, 289 records were excluded based on eligibility criteria. A total of 44 full-text articles were assessed for eligibility. Following full-text review, 38 studies were excluded for not meeting the inclusion criteria. Finally, 6 studies were included in the qualitative synthesis (see Figure nº 1). All included studies implemented high-intensity functional training (HIFT) or CrossFit-based interventions within school-based physical education settings. Five studies were published in English and one in Spanish.

Study Characteristics

The six included studies were published between 2016 and 2021, originating from the United States (n=3; Ward et al., 2017; Garst et al., 2020; Pruitt & Morini, 2021) and Spain (n=3; Fuentes-Lorca, 2016; Sierra-Ríos et al., 2021; Evangelio et al., 2021).

Sample sizes ranged from 37 to 166 participants. While this review focused on primary school children aged 6–12 years, two studies included participants who slightly exceeded this age range. Evangelio et al. (2021) included students up to 13 years of age, whereas Garst et al. (2020) reported a mean age of 12.7 years, indicating that most participants were still within the transition between primary and lower

secondary education. These studies were retained because the majority of participants corresponded to the target educational stage, the interventions were implemented within school-based physical education settings, and excluding them would have substantially reduced the already limited evidence base. Nevertheless, their findings should be interpreted with caution when extrapolating conclusions specifically to children aged 6–12 years.

Study designs were heterogeneous, comprising quasi-experimental pre–post designs (Fuentes-Lorca, 2016; Ward et al., 2017; Evangelio et al., 2021), a randomized controlled trial (RCT) (Garst et al., 2020), an acute-exercise experimental design (Pruitt & Morini, 2021), and a quasi-experimental comparison of training models (Sierra-Ríos et al., 2021).

Intervention Characteristics

Interventions were implemented within regular physical education classes. Session duration ranged from 30 to 45 minutes, with a frequency of one to three sessions per week. Total intervention length varied between 4 and 12 weeks. Exercise intensity was generally reported as moderate to high across studies.

Two studies (Ward et al., 2017; Sierra-Ríos et al., 2021) used objective monitoring methods, including accelerometry and heart rate monitoring, to assess physiological load. Across all studies, adherence to the interventions was reported as high, and no adverse events were recorded.

A detailed summary of the included studies is presented in Table nº 1.

Table 1. Summary of included articles.

Reference	Aim of the Study	Participants	Variables / Instruments	Procedure / Intervention	Results
Ward et al. (2017)	To assess physical fitness and knowledge outcomes from a CrossFit-style unit in primary PE.	166 fifth graders (~10–11 years old).	FITNESSGRAM, accelerometers, HRF knowledge test.	4-week unit (20 lessons) "CrossFit Challenge" integrated into PE (Sport Education framework).	Increased fitness and knowledge; participants spent ~54.5% of lesson time in MVPA.
Garst et al. (2020)	To evaluate CrossFit Kids effects vs. standard PE on youth outcomes.	144 students (mean age 12.7 years old—middle school sample).	FITNESSGRAM, psychosocial surveys, academic records.	Year-long CrossFit Kids (CFK) program integrated into school PE vs standard PE.	Both groups improved fitness; CFK group showed greater strength gains and self-confidence; small decrease in academic grades reported for CFK group in that period.
Fuentes-Lorca (2016)	To analyze CrossFit-type circuits' effects on fitness and BMI.	37 sixth graders (11–12 years old).	Physical performance tests (strength, endurance, agility, speed), BMI, IPAQ (self-reported activity).	CrossFit-style circuit sessions (45 min: 5′ warm-up, 30′ circuit, 10′ cooldown).	Improvements in fitness measures; reductions in BMI; increased reported activity levels.
Pruitt & Morini (2021)	To test exercise type/timing on word learning.	48 children (6–12 years old) across two acute-exercise experiments.	Word recall and retention tasks (cognitive measures).	Single acute sessions comparing aerobic vs anaerobic exercise performed	Aerobic exercise preceding learning improved word recalls in some conditions compared with anaerobic exercise.
Sierra-Ríos et al. (2021)	To compare SSG vs. SSG+CrossFit-type strength on load responses.	55 fourth graders (mean age 9.04 ± 0.19 years old).	Accelerometry (ActiGraph), Polar HR monitors; internal/external load metrics.	7 weeks; 2 × 45 min/week. Experimental group performed 8-exercise TABATA-style strength circuit before SSG.	Different internal/external load responses between conditions; adaptation benefits observed in mixed protocol.
Evangelio et al. (2021)	To explore students' perceptions of an Edu-CrossFit unit and hybrid pedagogical models.	115 students (approx. 10–13 years old; some participants aged 13).	Interviews, Likert surveys, observational data (motivation, cooperation, perceived competence).	13 × 45-minute Edu-CrossFit lessons, hybridizing Sport Education + Cooperative Learning + Health-based PE.	Positive student perceptions: high motivation, cooperation, perceived competence; some inclusion of 13-year-olds.

Source: own elaboration.

Quality assessment of Included Studies

The methodological quality of the included studies was assessed using the Joanna Briggs Institute (JBI) critical appraisal tools. Overall, the methodological quality was considered moderate across studies.

Only one study employed a randomized controlled design, while the remaining studies were quasi-experimental or acute experimental in nature. Common methodological limitations included lack of blinding, limited control of confounding variables, and small sample sizes. Despite these limitations, most studies clearly defined inclusion criteria, used valid and reliable outcome measures, and applied appropriate statistical analyses.

The results of the JBI assessment are presented in Table nº2.

Table 2. Methodological quality assessment using Joanna Briggs Institute (JBI) checklists.

Study	Design	Randomization	Groups comparable	Clear inclusion criteria	Confounding addressed	Blinding	Outcome measurement validity	Follow-up completeness	Appropriate statistics	Overall quality
Ward et al., 2017	Quasi-experimental	No	Moderate	Yes	No	No	Yes	Moderate	Yes	Moderate
Fuentes-Lorca, 2016	Quasi-experimental	No	Unclear	Yes	No	No	Yes	Moderate	Yes	Low–Moderate
Garst et al., 2020	RCT	Yes	Yes	Yes	Partially	No	Yes	High	Yes	Moderate
Pruitt & Morini, 2021	Acute experimental	No	Yes	Yes	No	No	Yes	High	Yes	Moderate
Sierra-Ríos et al., 2021	Quasi-experimental	No	Moderate	Yes	No	No	Yes	Moderate	Yes	Low–Moderate
Evangelio et al., 2021	Quasi-experimental	No	Moderate	Yes	No	No	Yes	Moderate	Yes	Moderate

Source: own elaboration.

Synthesis of Outcomes

Physical Fitness Outcomes

Physical fitness was the most frequently assessed outcome across studies. Ward et al. (2017) reported improvements in cardiorespiratory fitness, muscular strength, and physical activity-related knowledge following a 4-week CrossFit-style unit. Similarly, Fuentes-Lorca (2016) observed improvements in muscular endurance, aerobic capacity, and reductions in BMI following circuit-based interventions. Garst et al. (2020) reported greater improvements in strength outcomes in the CrossFit Kids group compared to standard physical education. Sierra-Ríos et al. (2021) reported different internal and external load responses between intervention conditions in a combined small-sided games and HIFT protocol.

Physiological Load and Intensity

Two studies objectively measured physiological load using accelerometry and heart rate monitoring. Ward et al. (2017) reported that students accumulated 54.5% of class time in moderate-to-vigorous physical activity (MVPA). Sierra-Ríos et al. (2021) reported differences in internal and external load responses between experimental conditions in a school-based physical education setting.

Psychosocial and Motivational Outcomes

Psychosocial outcomes were assessed in several studies. Garst et al. (2020) reported improvements in self-confidence and perceived competence following a CrossFit Kids intervention. Evangelio et al. (2021) reported positive student perceptions related to motivation, cooperation, and perceived competence following a hybrid pedagogical model integrating Sport Education and Cooperative Learning.

Cognitive and Academic Outcomes

Evidence regarding cognitive and academic outcomes was limited and mixed. Pruitt and Morini (2021) reported improvements in word recall following acute aerobic exercise in children aged 6–12 years. In contrast, Garst et al. (2020) reported a small decrease in academic grades over the intervention period in the CrossFit Kids group.

Discussion

Principal Findings

This systematic review synthesized evidence from six studies examining the application of high-intensity functional training (HIFT), including CrossFit-based interventions, within primary school physical education settings. Overall, the available evidence suggests that HIFT-based interventions may be associated with improvements in physical fitness and psychosocial outcomes in children aged 6–12 years. However, these findings should be interpreted as preliminary due to the small number of studies and their substantial methodological heterogeneity.

The feasibility of implementing HIFT within school-based physical education appears promising, with consistently reported high adherence. Nevertheless, conclusions regarding effectiveness and feasibility should be interpreted cautiously, as evidence is limited and based primarily on short-term interventions and non-randomized study designs.

Interpretation of Findings

Physical fitness and psychosocial outcomes

The observed improvements in physical fitness components, particularly muscular strength and cardiorespiratory fitness, are broadly consistent with previous literature on high-intensity functional training in adolescents and adults (Feito et al., 2018; Wang et al., 2023). These adaptations may be explained by the combined aerobic and resistance-based nature of HIFT; however, the heterogeneity of intervention protocols and outcome measures across studies prevents identification of specific effective training characteristics in children.

In school-based contexts, structured physical education interventions have been shown to improve health-related fitness outcomes when adequately designed and implemented (Dobbins et al., 2013; Álvarez-Bueno et al., 2017). However, the variability in HIFT implementation across studies limits the ability to compare findings or establish optimal training parameters for primary school populations.

Psychosocial outcomes such as motivation, perceived competence, and cooperation appear to be in line with evidence supporting student-centered and cooperative physical education models (Casey & Goodyear, 2015; Haerens et al., 2011). It is likely that these outcomes are influenced not only by the HIFT stimulus itself, but also by the pedagogical frameworks used to deliver the interventions.

Physiological load and intensity

Only a limited number of studies objectively assessed physiological load using accelerometry and heart rate monitoring. These findings are consistent with broader evidence indicating that well-structured physical education lessons can contribute to achieving moderate-to-vigorous physical activity (MVPA) targets recommended by the World Health Organization (WHO, 2020). However, achieving sustained MVPA in school settings is highly dependent on lesson design and instructional strategies (Fairclough & Stratton, 2005).

Cognitive and academic outcomes

Evidence regarding cognitive and academic outcomes remains scarce and inconsistent. Acute exercise has been associated with short-term improvements in cognitive performance in children, particularly in memory-related tasks (Hillman et al., 2008; Donnelly et al., 2016). However, the long-term effects of HIFT-based interventions on cognitive and academic outcomes remain unclear due to the limited number of studies and short intervention durations.

The isolated finding of a potential negative effect on academic performance in one study should be interpreted with caution, as broader evidence generally suggests neutral or positive associations between physical activity and academic achievement (Singh et al., 2012).

Safety considerations

Although no adverse events were reported in the included studies, this should not be interpreted as evidence of safety. The absence of systematic injury surveillance and the limited duration of interventions restrict the ability to draw conclusions regarding safety. Pediatric exercise research highlights the

importance of monitoring training load and injury incidence, particularly in higher-intensity modalities (Lloyd et al., 2014; Faigenbaum & Myer, 2010).

Given these limitations, the safety of HIFT in primary school children remains insufficiently established

Methodological limitations and implications (new)

The included studies exhibited substantial heterogeneity in design, intervention characteristics, and outcome measures, which is a common limitation in school-based exercise intervention research (Boreham & Riddoch, 2001). This heterogeneity precluded meta-analysis and limits comparability across studies.

Most studies were quasi-experimental in nature, with only one randomized controlled trial, resulting in a generally low-to-moderate level of evidence according to established hierarchies (Sackett et al., 1996). Small sample sizes and short intervention durations further limit both internal validity and generalizability.

Practical Implications

Despite these limitations, the available evidence suggests that HIFT-based interventions may be feasible and engaging option for school-based physical education when appropriately adapted to developmental needs. Evidence from physical education research highlights the importance of structured and engaging programs for improving physical activity and fitness in children (Institute of Medicine, 2013).

However, careful attention should be paid to progression, intensity control, and pedagogical design to ensure age-appropriate implementation and to minimize potential risks (Lloyd et al., 2014; Faigenbaum et al., 2013).

Limitations and Future Directions

Despite the potentially promising findings identified in this review, the current evidence base remains limited and should be interpreted with caution.

1. Methodological Rigor: Most included studies employed quasi-experimental or acute experimental designs and relatively small sample sizes, limiting the ability to establish causal relationships and reducing the overall strength of the evidence. Only one randomized controlled trial was identified.Intervention
2. Heterogeneity: Considerable heterogeneity was observed across studies in terms of intervention duration, HIFT protocols, pedagogical models, and outcome measures. This variability limited direct comparability between studies and precluded quantitative synthesis or meta-analysis.
3. Sample and Safety Considerations: Two of the included studies incorporated participants slightly outside the predefined age range (6–12 years), reflecting the scarcity of research specifically focused on primary school populations. Furthermore, although no adverse events were reported, the absence of systematic injury surveillance and long-term follow-up prevents definitive conclusions regarding safety in pediatric populations.

Additional limitations should also be acknowledged. Although the selected databases provided broad multidisciplinary coverage, SPORTDiscus, a specialized database in sport and exercise sciences, was not included. Consequently, some potentially relevant studies may not have been identified despite the complementary manual and Google Scholar searches.

Future research should prioritize larger and methodologically rigorous randomized controlled trials with standardized HIFT protocols and longer follow-up periods. Further studies should also incorporate objective monitoring of physiological load, systematic reporting of adverse events, and broader educational and sociocultural contexts to better understand the effectiveness, feasibility, and safety of HIFT-based interventions in primary education.

Conclusions

This systematic review provides an overview of the available evidence on high-intensity functional training (HIFT), including CrossFit-based interventions, implemented in primary school physical education settings for children aged 6–12 years. The limited evidence available suggests that such interventions may be associated with improvements in certain physical fitness components, particularly muscular strength and cardiorespiratory fitness, and may also support positive psychosocial outcomes such as motivation, perceived competence, and cooperation.

However, these findings should be interpreted cautiously due to the small number of studies and their substantial methodological and clinical heterogeneity. The included studies were predominantly quasi-experimental, with considerable variation in intervention design, duration, and outcome measures. Consequently, the current evidence base does not allow for definitive conclusions regarding the effectiveness of HIFT in this population.

Although no adverse events were reported, this finding is insufficient to establish safety, given the limited sample sizes, short intervention durations, and absence of systematic injury surveillance across studies.

Overall, the current evidence suggests that HIFT-based interventions may represent a potentially feasible approach for primary school physical education when appropriately adapted to children's developmental characteristics. However, this conclusion remains tentative because it is based on a small number of heterogeneous studies that did not systematically monitor adverse events or injuries.

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Declaration of IA

The authors utilized artificial intelligence (AI) tools exclusively to polish and improve the English phrasing and academic tone of the original draft. After using this tool, the authors rigorously reviewed and edited the text, and take full responsibility for the final content of the publication

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Authors and translators' details:

Igor Conde Cortabitarte	icondecortabitarte@gmail.com	Autor/a
David Díaz Tejerina	diaztdavid@uniovi.es	Autor/a