European Journal of Physical Education and Sport Science
ISSN: 2501 - 1235
ISSN-L: 2501 - 1235
Available on-line at: www.oapub.org/edu

DOI: 10.46827/ejpe.v13i1.6511 Volume 13 | Issue 1 | 2026

EFFECTS OF RECREATIONAL PHYSICAL ACTIVITY ON PHYSICAL FITNESS AND PHYSIOLOGICAL HEALTH IN AFRICAN SCHOOL CHILDREN AGED 6–12 YEARS (2015 – 2025): A SCOPING REVIEW

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Abstract:
Background: Recreational physical activity is a cost-effective way to stem rising non-communicable disease in African children, yet evidence is scattered. **Objective:** To synthesise primary studies published between January 2015 and June 2025 on the impact of recreational physical activity on the physical fitness and physiological health of African pupils aged six to twelve years. **Methods:** Adhering to PRISMA guidelines, five databases were searched for peer-reviewed English-language studies evaluating sports, active play or school programmes; systematic reviews were excluded. **Results:** Six studies met criteria: three cluster randomised controlled trials and three cross-sectional surveys from Egypt, Ghana, the Ivory Coast, Tanzania and South Africa. Structured activity improved coordination, leg strength and shuttle-run endurance. Interventions with trained teachers and equipment additionally lowered waist circumference, resting blood pressure, glycated haemoglobin and lipid ratios. Observational data revealed a dose–response between daily moderate to vigorous activity and estimated maximal oxygen uptake. Children in rural settings were more active and fitter than those in urban townships. Girls engaged in less vigorous activity but, when active, equalled or

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surpassed boys on selected fitness tests. **Conclusion:** Although the evidence base is small, it consistently shows that well-delivered recreational physical activity yields measurable gains in cardiovascular and musculoskeletal fitness and early metabolic health in African primary school children. Policies ensuring teacher training, safe play spaces and inclusive activity opportunities are essential.

Keywords: recreational physical activity; physical fitness; physiological health; schoolchildren; Africa

1. Introduction

Recreational physical activity is widely recognised as a cornerstone of child health and development. Among school-aged children, regular participation in sports, active play, and outdoor games confers diverse benefits – improving muscular strength, motor skills, and cardiorespiratory fitness, while helping to regulate body weight and enhance metabolic function (Abdelkarim *et al.*, 2024; Gerber *et al.*, 2021). These benefits are especially pertinent in low- and middle-income regions like Africa, where an emerging dual burden of infectious disease and non-communicable diseases heightens the need for preventive health measures in youth (Gerber *et al.*, 2021; Müller *et al.*, 2020). Basic school pupils (approximately ages 6–12) represent a critical window for intervention, as habits formed in childhood can track into adulthood. Yet, socio-economic and infrastructural barriers in many African contexts, such as limited physical education resources and prioritisation of academics over exercise, may hinder children's opportunities for regular physical activity (Abdelkarim *et al.*, 2024; Dolley *et al.*, 2023). In this scoping review, we examined the evidence from the past decade (2015–2025) on how recreational physical activities affect the physical fitness and physiological health of African schoolchildren aged 6–12 years. We focussed on primary research studies that evaluated sports, play, or school-based activity programs and measured outcomes such as strength, motor proficiency, endurance, body composition, cardiovascular fitness, and other health parameters in this population. The goal was to synthesise current knowledge on the magnitude and mechanisms of activity-related benefits among African youth and discuss their implications for public health strategies.

2. Methods

We conducted a scoping review to capture relevant peer-reviewed primary research published in the last ten years (January 2015 - June 2025) following the scoping review framework proposed by Arksey and O'Malley (2005), and adhered to the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines (Page *et al.*, 2021; Moher *et al.*, 2009) for reporting. The inclusion criteria were: (i) studies of children approximately 6–12 years old enrolled in African schools; (ii) an exposure or intervention involving recreational physical activities (e.g. sports participation, active

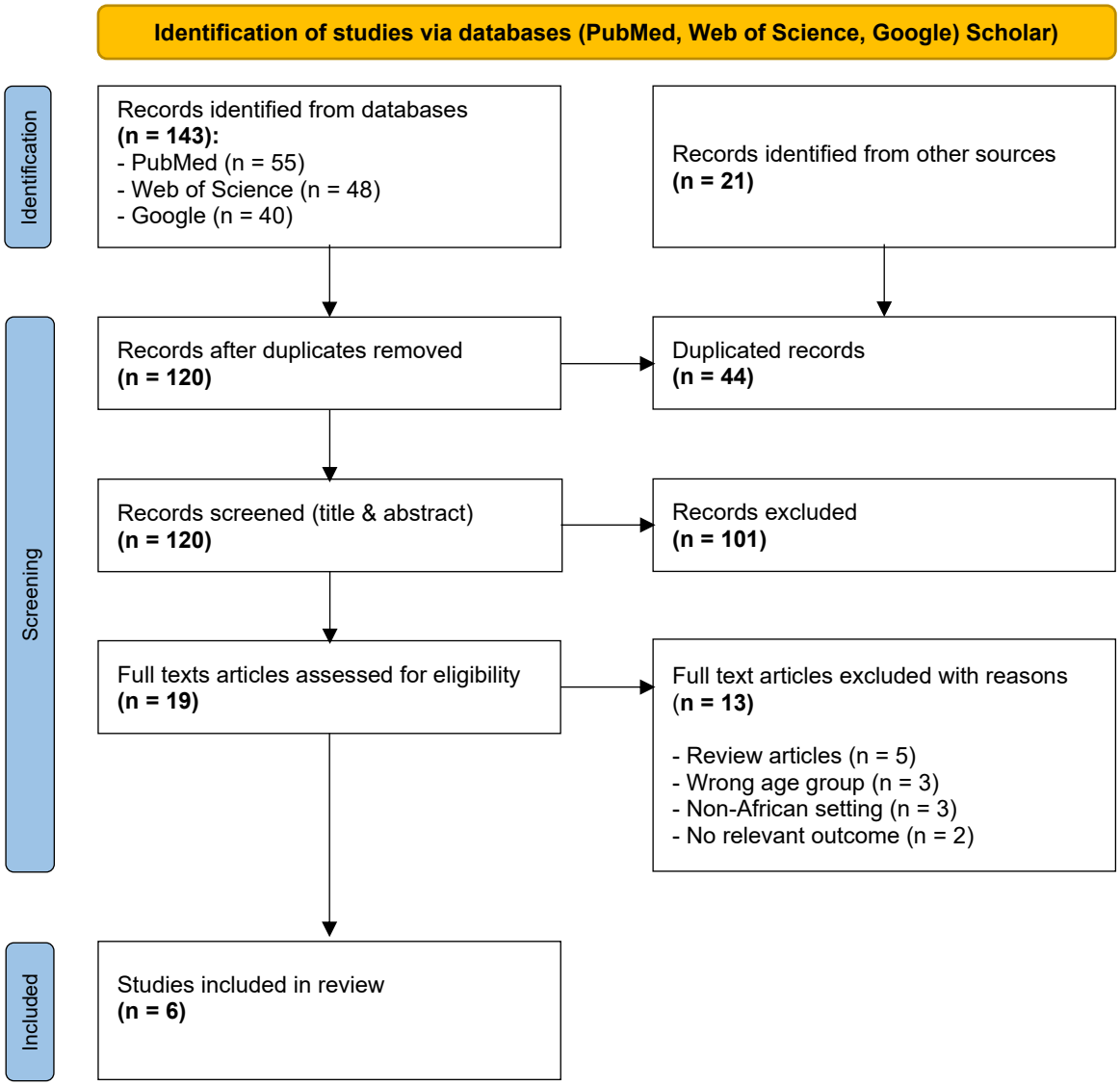
play, outdoor games, or physical education programs); (iii) reported outcomes on physical parameters (such as fitness test performance, strength, motor skills, endurance capacity, body mass index or body composition) and/or physiological parameters (such as cardiorespiratory fitness levels, heart rate, blood pressure, or other health markers); (iv) primary empirical research (experimental or observational) published in reputable scholarly journals. We excluded review articles (systematic reviews, meta-analyses) to focus on original studies.

A comprehensive search was performed using academic databases and search engines (PubMed, Web of Science, Scopus, Semantic Scholar and Google Scholar) with combinations of keywords: physical activity, exercise, sport, play, children, Africa, fitness, health, and school. We screened titles and abstracts for relevance, then read full texts to identify studies meeting the criteria. Data extracted from each study included the study design, sample characteristics, description of the physical activity or intervention, outcome measures, and key results (including statistical significance and effect sizes when reported). Given the heterogeneity of study designs, a formal quality appraisal was not the focus; instead, we mapped the evidence to provide an overview of findings (consistent with scoping review methodology). We summarised the included studies in Table 1, and then synthesised common findings across studies.

3. Summary of Included Studies

With reference to Figure 1, a total of six studies met our inclusion criteria. These encompassed both intervention trials and observational studies across various African regions, including Southern, West, and North Africa. Table 1 presents an overview of each study's methods and main outcomes. The sample sizes ranged from controlled trials with just over 100 children to cross-sectional surveys of several hundred pupils. Interventions, when applied, were typically school-based and lasted from 6 weeks up to 3 years, targeting increases in physical activity through guided play, sports, or physical education lessons. The outcome metrics varied accordingly, from standardised physical fitness test batteries (measuring strength, speed, coordination, and endurance) to health indicators such as blood pressure and cholesterol.

Figure 1: PRISMA flow diagram of scoping review methodology



Source: Page MJ, *et al.* BMJ 2021; 372:n71. doi: 10.1136/bmj.n71.

Table 1: Characteristics and key findings of included studies (January 2015 – June 2025)

Study (Location)	Design & Participants	Recreational Activity Intervention/Exposure	Outcomes Measured	Key Findings
(Uys *et al.*, 2016) (South Africa)	3-year cluster RCT; 16 primary schools (N=1,000, ages ~8–12)	"HealthKick" whole-school program (nutrition + physical activity promotion); low-intensity implementation	Eurofit fitness tests (aerobic shuttle run, sit-ups, etc); BMI; PA knowledge/attitude questionnaires	No significant improvement in overall fitness versus controls. Only sit-up performance improved modestly in the intervention group ($p < 0.05$), with no changes in other

				fitness measures. No impact on physical activity behaviours or attitudes; authors concluded the low-dose intervention was insufficient to enhance fitness in this context.
(Dolley *et al.*, 2023) (South Africa)	20-week cluster RCT; 8 low-income schools (N=961, ages 9–12)	"KaziKidz" school-based health program with varying support levels: teacher training workshops, provision of a PE coach, and PA toolkit (lessons) in different combinations	Physiological: Waist circumference, blood pressure, glycated haemoglobin (HbA1c), blood lipids; Behavioural: Accelerometry-measured moderate-to-vigorous PA (MVPA)	Intervention groups with teacher support showed significant improvements in children's cardiovascular risk markers and PA levels. Schools receiving training workshops (and especially those with an extra PE coach) saw reductions in NCD risk factors and increased MVPA compared to controls. The toolkit alone (without training support) yielded little change. This suggests that structured support for teachers is crucial for health gains in under-resourced schools.
(Abdelkarim *et al.*, 2024) (Egypt)	6-week controlled trial; one primary school (N=125, ages ~8–12)	"Be Fit" PA program – daily structured non-competitive physical activities tailored for children (part of DELICIOUS project)	International Physical Performance Test Profile (IPPTP) battery: coordination (timed lateral jumps), speed (50m run), lower-body and upper-body muscular strength, aerobic endurance	Significant gains in specific fitness components after 6 weeks. Children's coordination and lower-body strength improved significantly ($p < 0.01$). Aerobic endurance also increased with a

			(20m shuttle run); BMI/body composition	trend toward significance ($p = 0.06$). No significant change in BMI, speed sprint, or upper-body strength. The pilot demonstrates that short, fun activity sessions can enhance motor skills and leg strength, though a longer or more intensive program may be needed for aerobic fitness and other metrics.
(Gerber *et al.*, 2021) (Côte d'Ivoire, South Africa, Tanzania)	Cross-sectional baseline survey; 3 sites (N=~2,166 children total; ages ~8–11)	Habitual PA and play in daily life, measured by 7-day accelerometry; comparison of an urbanised setting (South Africa) vs. rural/semi-rural settings (Tanzania, Côte d'Ivoire)	Physical activity levels: daily minutes of MVPA, sedentary time; Cardiorespiratory fitness: 20m shuttle run test (VO_2 max estimate)	Activity and fitness levels differed by setting and sex. Tanzanian children (rural) had the highest MVPA (94% meeting 60-min/day) and best fitness, while South African (urban township) children had the lowest (77% meeting MVPA). Boys were more active than girls in all sites (sex gap largest in urban South Africa). Crucially, higher MVPA was strongly associated with higher shuttle-run endurance (better CRF) across the pooled sample. This underscores that even in African contexts, more active children exhibit superior

				cardiovascular fitness. Urbanisation and gender disparities in activity emerged as risk factors for lower fitness.
(Müller *et al.*, 2020) (South Africa)	Cross-sectional study; 8 disadvantaged schools in Eastern Cape (N=650, ages 10–15)	Objectively measured PA (7-day accelerometry) and fitness (20m shuttle run) in a routine environment; analysis of associations with health indicators.	Physical activity: % meeting PA guideline (60 min MVPA/day); CRF: shuttle run laps; Physiological: composite cardiovascular risk score from blood pressure, cholesterol, glucose, skinfolds	A clear dose-response relationship exists between activity, fitness, and health. About 41% of these children did not meet PA recommendations. Those in the highest quartile of CRF or PA had significantly lower clustered cardiovascular risk scores than those in the lowest quartile ($p < 0.001$). In other words, fitter and more active children showed healthier profiles (lower adiposity and better blood pressure/glucose). This reinforces that even in poor communities, physical inactivity is a key driver of emerging cardiovascular risks.
(Annan *et al.*, 2020) (Ghana)	Cross-sectional survey; 10 primary schools in Kumasi (N=438, ages ~9–12)	Self-reported exercise habits (participation in any regular sports or play) and dietary factors (breakfast intake) – examined about fitness and weight status	Physical fitness battery: 50m sprint, standing broad jump, handgrip strength, sit-ups, flexibility, combined into an overall fitness score; Anthropometry: BMI and	Children who engaged in exercise were fitter. Nearly 90% reported some regular exercise; these active children had significantly higher overall fitness scores than those

			under/overweight classification	who were inactive. Mean fitness performance was surprisingly higher in girls than boys (girls excelled in sprint and jump tests) despite girls' higher prevalence. BMI showed only weak associations with fitness (e.g. higher BMI correlated with better grip strength but fewer sit-ups). This study suggests that even light recreational exercise (e.g. walking to school or playing) is linked to better fitness in Ghanaian pupils, and it highlights emerging gender and nutrition trends (with ~10% overweight in this cohort).

Note: RCT = randomised controlled trial; PA = physical activity; MVPA = moderate-to-vigorous physical activity; CRF = cardiorespiratory fitness; NCD = non-communicable disease; PE = physical education; BMI = body mass index.

4. Key Findings

4.1 Physical Fitness Outcomes

Across studies, engaging in regular physical activity or sports was consistently associated with better performance on fitness measures. Children exposed to a structured exercise program showed gains in motor abilities and strength (for example, improved coordination and leg power in Egypt's Be Fit intervention) (Abdelkarim *et al.*, 2024). Cross-sectional data from Ghana likewise indicated that pupils who reported habitual exercise had higher aggregate fitness scores than their less-active peers (Annan *et al.*, 2020). Notably, one long-term school intervention in South Africa (HealthKick) did not yield broad fitness improvements – possibly due to its low implementation intensity (Uys *et al.*, 2016). Only a slight improvement in abdominal strength (sit-ups) was observed in

that 3-year program, emphasising that simply instituting a program is insufficient without robust engagement (Uys *et al.*, 2016). In contrast, the shorter (6-week) but focused Egyptian program produced measurable gains in coordination and strength, suggesting that even brief interventions can enhance certain fitness domains if they are well-designed and activity-specific (Abdelkarim *et al.*, 2024). Taken together, these findings underscore that the type, intensity, and duration of activity programs are critical determinants of physical fitness benefits. Programs that are frequent, engaging, and developmentally appropriate appear effective in improving children's motor skills, muscular strength, and endurance, whereas diluted or irregular interventions show limited impact (Uys *et al.*, 2016).

4.2 Physiological and Health Parameters

Several studies examined how recreational activity influences children's physiological health, including cardiovascular risk factors. The evidence indicates that active children tend to have more favourable health profiles. In South African cohorts, higher daily physical activity and superior cardiorespiratory fitness were linked to lower cardiovascular risk scores, reflecting healthier blood pressure, body composition, and metabolic readings (Müller *et al.*, 2020). For example, Müller *et al.* (2020) found that the fittest quartile of children had significantly better combined scores of blood pressure, cholesterol, and glucose compared to the least fit quartile (effect size $p<0.001$) (Müller *et al.*, 2020). This association aligns with extensive pediatric exercise research showing that regular vigorous activity improves vascular function, enhances insulin sensitivity, and helps prevent excessive fat gain (Gerber *et al.*, 2021; Müller *et al.*, 2020). Intervention trials provided corroborating causal evidence: in the KaziKidz trial, schools that received a well-supported physical activity program (with teacher training and coaching) saw reductions in risk markers like central adiposity and blood lipid ratios, alongside increased MVPA levels (Dolley *et al.*, 2023). Although exact effect sizes varied by specific outcome and subgroup, the trend was clear that more robust physical activity exposure yielded clinically meaningful improvements, such as lower glycated haemoglobin and improved cholesterol profiles in certain intervention groups (as reported in the KaziBantu study) (Arnaiz *et al.*, 2023). It is important to note that not all physiological measures responded uniformly: the Egyptian pilot showed no significant change in BMI after 6 weeks, which is unsurprising given the short timeframe and the fact that BMI may not shift noticeably with brief activity alone (Abdelkarim *et al.*, 2024). However, these studies highlight multiple pathways by which active play and exercise benefit children's physiology – from strengthening the cardiovascular system to improving metabolic health – even in young populations and within resource-limited African settings.

4.3 Influence of Context (Setting and Gender)

The included research also sheds light on how socio-demographic factors modify the activity–health relationship. A recurring theme is the urban-rural divide and gender gap. Gerber *et al.* (2021) documented that children in a rural Tanzanian setting were far more

active and fit than those in a South African township, likely reflecting lifestyle differences (more outdoor play and active chores in rural life) (Gerber *et al.*, 2021). Urbanisation in Africa often coincides with reduced physical activity (due to safety concerns, limited play spaces, and sedentary entertainment), and this was evident in the comparatively lower fitness of the urban cohort (Gerber *et al.*, 2021). Gender disparities were noted in multiple studies: boys generally accrued more MVPA than girls (Gerber *et al.*, 2021), consistent with global trends of boys having greater access or cultural encouragement for sports. However, interestingly, the Ghanaian study found girls scored higher on some fitness tests than boys (Annan *et al.*, 2020). This counterintuitive finding might be due to sampling or maturation differences, but it also suggests that with adequate opportunity, girls are equally capable of achieving fitness gains. The public health implication is that interventions should pay special attention to engaging girls, who, in some contexts, may face more barriers to active play, and to providing safe, accessible activity options in urban schools (Gerber *et al.*, 2021). Contextual factors such as school resources, teacher training, and community support were also highlighted. The success of the KaziKidz intervention was attributed in part to training generalist teachers and providing equipment in under-resourced schools (Dolley *et al.*, 2023). In contrast, many schools in low-income areas cannot implement regular physical education without external support (Dolley *et al.*, 2023). Thus, the studies collectively point to the need for structural solutions (policy and resource allocation) so that all children, regardless of gender or location, can reap the physical and physiological benefits of recreational activity.

5. Discussion

This scoping review finds accumulating evidence that recreational physical activities confer significant fitness and health benefits for African children aged 6–12, though outcomes vary with program quality and context. In line with fundamental exercise science principles, studies from diverse African settings show that when children engage in regular moderate-to-vigorous activity, they tend to develop stronger muscles, better motor coordination, and higher endurance capacity than their inactive peers (Abdelkarim *et al.*, 2024; Annan *et al.*, 2020). Physiologically, active children demonstrate more robust cardiovascular profiles – including lower blood pressure, healthier body composition, and improved metabolic markers – indicating a lower risk trajectory for chronic diseases (Müller *et al.*, 2020). These findings resonate with prior research from high-income countries and confirm that key mechanisms (for instance, exercise-induced improvements in cardiac output, endothelial function, and energy metabolism) are universal in their benefits (Gerber *et al.*, 2021). Notably, the magnitude of effects observed in the reviewed studies is modest to moderate, which is expected given the young age of participants and often short intervention durations. For instance, a 6-week play intervention boosted certain fitness measures by a statistically significant margin (Abdelkarim *et al.*, 2024), and a 20-week school program produced measurable drops in

cholesterol and glycemic indices in intervention groups – meaningful improvements, albeit not a complete remedy for all risk factors (Arnaiz *et al.*, 2023).

The methodological characteristics of the studies help explain some differences in outcomes. Rigorous randomised trials (e.g. HealthKick, KaziKidz) provide high-quality evidence but also revealed how intervention intensity matters: a multi-component program that was insufficiently implemented failed to improve fitness broadly (Uys *et al.*, 2016), whereas more comprehensive interventions (with teacher training and adequate activity frequency) succeeded (Dolley *et al.*, 2023). This suggests that policy efforts should ensure school programs are not merely instituted in name but supported with training, curriculum time, and equipment. Cross-sectional studies, while less able to prove causation, consistently showed strong associations between activity levels and health indicators (Annan *et al.*, 2020; Müller *et al.*, 2020). The convergence of evidence from both trial and observational data strengthens confidence in a cause-and-effect relationship between an active lifestyle and better health in this age group. However, one should be cautious about confounding factors in observational data (for example, healthier children might also be more active to begin with).

A noteworthy aspect is the public health relevance of promoting recreational activity among African schoolchildren. With a rising prevalence of pediatric overweight and lifestyle-related conditions in parts of Africa, integrating physical activity in schools could be a cost-effective strategy to improve population health indicators (Annan *et al.*, 2020). The reviewed studies underscore that benefits are attainable within the school setting if hurdles are addressed. Lack of infrastructure, large class sizes, and competing academic priorities are real challenges. Yet, the success of interventions like KaziKidz, which leveraged existing school periods (physical education and brief activity breaks) and improved teacher capacity, demonstrates a feasible path forward (Dolley *et al.*, 2023). Additionally, cultural attitudes valuing education sometimes inadvertently de-emphasise play, particularly for girls or in exam-focused environments (Abdelkarim *et al.*, 2024; Gerber *et al.*, 2021). Public health programs should therefore also aim to shift perceptions, highlighting that healthy children are more likely to become healthy, cognitively ready learners – an argument supported by evidence linking fitness with academic performance and quality of life (Gerber *et al.*, 2021). In practical terms, multi-sectoral approaches involving the education sector, community sports organisations, and health agencies will be needed to implement sustainable activity programs in schools.

While this review focused on Africa, its implications are globally relevant: it reinforces that providing children with opportunities and encouragement for active play is a universally beneficial investment. Mechanistically, regular play and exercise stimulate physiological adaptations – increased aerobic capacity, muscular development, and neuromotor coordination – that underpin both current well-being and future health resilience (Abdelkarim *et al.*, 2024; Gerber *et al.*, 2021). For African countries, where resources may be limited, the priority should be on low-cost, high-impact interventions: for example, active recess games, running clubs, and culturally appropriate sports that can be run with minimal equipment. Encouragingly, even simple activities like running,

jumping, and body-weight exercises (as used in some reviewed interventions) proved effective in improving key health metrics. Governments and stakeholders should leverage this evidence to advocate for stronger school physical activity policies, teacher training in physical education, and community programs that foster active lifestyles from an early age.

5.1 Limitations

It should be noted that the body of research specific to Africa is still emerging. Our scoping approach included a range of study designs – some with small sample sizes or short follow-up, which may limit generalizability. There is also a paucity of long-term follow-up data to show if early improvements in fitness track into adolescence. Moreover, we excluded systematic reviews; however, one recent review of African school-based interventions concurs that effects on BMI and fitness have been modest overall, calling for more intensive strategies (Uys *et al.*, 2016). Despite these caveats, the consistency of positive trends across independent studies bolsters the credibility of the conclusions. Future research should aim to address gaps such as the optimal dose of activity for various health outcomes, the role of diet in conjunction with exercise (since a couple of interventions were multi-faceted), and strategies to overcome barriers unique to low-resource school settings.

6. Conclusion

In summary, evidence from the past decade indicates that recreational physical activity can meaningfully enhance the physical fitness and physiological health of African children in the basic school age range. Regular participation in sports, active play, or well-implemented physical education is associated with stronger muscles, better motor skills, and improved endurance, as well as favourable effects on cardiovascular and metabolic parameters in children 6–12 years old. These benefits are driven by known physiological mechanisms, ranging from improved cardiac output and circulation to healthier body composition, which collectively contribute to disease prevention and holistic development. To harness these benefits at the population level, African schools and communities should be supported in creating environments that encourage daily physical activity for all children. The findings highlight that simply having children "move more" is not a trivial matter of play – it is a potent public health tool that can lay the foundation for a healthier next generation. Ensuring that interventions are sufficiently intensive, age-appropriate, and inclusive (bridging gender and urban-rural gaps) will be key. This review underscores that active kids become healthy adults, and even amid resource constraints, fostering active lifestyles in childhood is both feasible and imperative for Africa's public health future.

Conflict of Interest Statement
The authors declare no conflicts of interest.

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