

Review

Active Schools in Europe—A Review of Empirical Findings

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Abstract: Physical activity is an important part of children's and young people's healthy functioning, but evidence suggests many students are inactive to the extent that they are compromising their well-being. Traditionally, schools have played a minor role in contributing to physical activity, but it has held relatively low prestige. Some commentators have called for Whole-School or Active School approaches. Physical activity, in these models, is integrated into all aspects of school life. This article reports on a review of the most-cited elements of school-based physical activity promotion, assesses evidence of actual and potential contributions, and provides a tentative weight of evidence judgement for each component. A rapid reviewing methodology was followed, and the searches used a range of specialist academic databases (PsycARTICLES, PsycINFO, SPORTdiscus, CINAHL Complete), Google Scholar, ResearchGate, and Academia.edu, restricted to 2010–2021. Six settings were found to have the potential to add physical activity time, although none suffices alone: Active Breaks; Active Homework; Active Learning; Active Recess; Active Transport; and School Sports. Active Schools offer a plausible solution to the problem of physical inactivity by adding moments of movement and integrating physical activity in all aspects of school life, underlining the need for school-level change, the consideration of stakeholder groups, and the social and physical environments of school.

Keywords: active breaks; active classrooms; active homework; active recess; active travel; adolescents; children; physical activity; physical education; school sports



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1. Introduction

Schools are expected to fulfil many different roles, but most would probably agree that two ambitions are central: the development of students' well-being and the knowledge, skills, attitudes, and values likely to encourage a happy and successful life [1]. Curriculum content has developed to support the constitutive elements of these ambitions. Among them, physical education (PE), sports, and other forms of physical activity (PA) have been recruited to play a role. Traditionally, however, these activities have held relatively low prestige, often justified as a break from the real business of schooling, namely academic work [2]. This situation changed significantly in recent years as falling levels of PA have led international agencies, national governments, and agencies to sound calls of alarm about rising incidents of non-communicable diseases, such as Type 2 diabetes, heart disease, and obesity [3]. Due to sitting behavior established at school, children and adolescents are also increasingly experiencing musculoskeletal disorders [4].

Despite the fact that regular PA is near-universally acknowledged to be an important part of children's and young people's healthy functioning, there is compelling and alarming evidence that large numbers of youth are inactive to the extent that they are compromising their well-being, both now and in later life [5]. Obese children and adolescents are around five times more likely to be obese in adulthood [6]. Globally, 50% of children do not meet the

internationally recognized target of 60 min moderate-to-vigorous physical activity (MVPA) per day [7,8]. This figure rises to 80% in higher-income countries [8] and persists into adolescence [9]. As the great majority of children have exposure to school, it is unsurprising that European policies promote whole-school approaches as one of the most promising investments for childhood and youth PA [4]. Indeed, for a growing number of children, schools provide the main opportunity for regular, structured sports and PA. A combination of economic pressures and parental safety concerns means fewer children can play games in non-school settings [10]. Therefore, schools' unique societal position has led to calls that they engage with public health issues, for example PA, more fully.

Clearly, the traditional framing of PA in school—primarily through PE lessons and, less often, school sports—will not suffice to meet this challenge. PE alone rarely occupies enough curriculum space to provide enough frequency, intensity, and duration of PA to accrue health benefits [11,12], and voluntary sports clubs often struggle to include precisely the students who need PA the most [13]. Many commentators have called for more comprehensive, whole-school, or Active School approaches [4,14–16]. In these approaches, PA is no longer isolated to PE or clubs, nor is it the sole responsibility of PE teachers [17]. It has also become clear that, along with increasing PA, schools' learning and living environments must change. Active School concepts consider the whole system and are "cause oriented" [4]. Some commentators have conceptualized school environments as complex adaptive subsystem [18] characterized by dynamic networks of interactions that produce emergent effects greater than the sum of the components [19]. The development and application of knowledge in this emergent field have been slowed by its inherent theoretical complexity and the limited knowledge of the existing evidence related to its components. This paper can be understood as a contribution to this second concern. It presents an overarching review of the most-cited elements of school-based PA interventions and practices, assesses evidence of actual and potential contributions to students' health-enhancing PA, and provides a tentative weight of evidence judgment for each component. This is the first holistic review of the outcomes associated with Active Schools. This approach seems appropriate as the Active Schools concept posits a synergistic effect in which discrete elements interact to create a school-wide impact. In other words, Active Schools inherently involve comprehensive oversight. This article concludes by evaluating the extent to which the notion of Active Schools might offer a practical, sustainable solution to the global challenges to children's and young people's well-being due to inactivity and sedentary lifestyles.

2. Methods

Evidence for these reviews was gathered using a rapid reviewing methodology. Rapid reviewing has become an increasingly popular form of evidence synthesis in which components of the systematic review process are simplified or omitted to produce information more quickly and/or for a more variegated response [20]. The multifaceted nature of the present study meant that a systematic review was not a viable option. However, the authors' hope was to realize some of the virtues of systematic reviewing without becoming overcome by its inherent restrictions. Searches used a range of specialist academic databases (PsycARTICLES, PsycINFO, SPORTdiscus, CINAHL Complete), Google Scholar, ResearchGate, and Academia.edu. The rationale for including the more general sources (Scholar, etc.) was partly a hope that they might generate findings that have been missed by the academic databases (this turned out not to be the case) and partly because they contain relevant research-orientated materials produced outside of traditional scientific publishing (the so-called 'grey literature'), which would be useful for informing the context of this study. Recommendations were made by members of the HEPAS (Healthy and Physically Active Schools in Europe) project team (see Acknowledgements for further details), who were sent a penultimate draft of the report and essentially acted as internal reviewers. The following criteria were used to keep searches focused:

- Published from 1 January 2010 to 30 May 2021;
- Study sample is made up wholly or mainly of school-aged children within the range of European nations (4-years-old to 17-years-old);
- Study conducted in either primary or secondary schools;
- Study investigated PA outcomes either as the sole or substantial focus;
- Empirical study or systematic review;
- Empirical studies based substantially or wholly in Europe.

These criteria were used to guide the recruitment of the most relevant studies. Following some earlier rapid reviews, we did not follow search strategies that rigorously excluded potential sources (such as PRISMA) but relied on the study’s aims and the exclusion criteria to inform judgments about relevance. Initial searches were conducted in English, followed by German, French, Spanish, and Czech. The search used broad MeSH terms (Medical Subject Headings) to capture the most current studies and reviews. For example, “recess” AND “physical activity” AND “children”. Data on each context of interest were extracted, and the findings were validated with reference to other gathered data and published reviews. These data-sets were then used as the sources for the creation of the narrative commentaries that appear later in this article. This approach was selected as most appropriate to reflect the variegated settings and the imperative to interpret findings in practically orientated ways. The reviews were limited by a focus on school-setting and school-aged children and young people.

The general approach followed an earlier set of PA reviews by Public Health England [21]. As such, it involved a purposive search, integration, and translation of relevant literature related to contexts for Active Schools. Once the different reviews had been completed, a group of experts (see Acknowledgements) independently evaluated the weight of evidence pertaining to the findings of each activity setting. Discrepancies were discussed, and a consensus was agreed upon for each area.

3. Results

3.1. Physical Activity Settings at School

As for the setting Physical Activity, 14 relevant systematic reviews were identified: five for Active Breaks, one for Active Learning, six for Active Recess and two for Active Transport (Table 1).

Table 1. Physical Activity Settings at School—Systematic Reviews.

Area	Source	Countries of Authors	Type of Review	Age Phase	Sample	Key Findings
Active Breaks	Daly-Smith, Zwolinsky, McKenna, et al. (2018)	UK/US	Systematic review	4–17 year olds	Inclusion criteria were focused on school-based bouts of classroom movement breaks with 4–17 year olds. Searches of eight scientific databases (to July 2017)	Three studies assessed PA. Interventions replaced sedentary time with either LPA or MVPA depending on design characteristics (mode, duration, intensity). Classroom movement break increased PA

Table 1. Cont.

Area	Source	Countries of Authors	Type of Review	Age Phase	Sample	Key Findings
Active Breaks	Erwin, Fedewa, Beighle, et al. (2012)	US	Systematic review		Searches of five scientific database, plus cascading using references in included studies. The range was Jan 1990–February 2010.	six studies measured effects of Active Breaks on PA. Breaks increased amount of PA in each school day. Primary school students affected most by interventions. Intervention length did not significantly influence intervention effect.
Active Breaks	Masini, Marini, Gori, et al. (2020)	Italy	Systematic review		Searches of six databases and grey literature, with no time restriction and up to April 2019.	Twenty-two intervention studies were found. Active Breaks interventions had a significant effect in increasing both MVPA and step count in primary school children.
Active Breaks	Norris, van Steen, Direito, et al. (2019)	UK, Netherlands, Singapore, Australia	Meta- analysis		Six searches of six databases and grey literature; no time restriction up to April 2019. Reference cascading in included studies.	Forty-two studies (thirty-nine preschool or elementary) identified. Active lessons produced significant increases in lesson-time PA, small increases on overall PA.
Active Breaks	Watson, Timperio, Brown, et al. (2017)	Australia	Systematic review	5–12 years of age	Searches of four databases and grey literature up to January 2017 were carried out.	Thirty-nine studies met the inclusion criteria, and sixteen provided sufficient data and appropriate design for inclusion in the meta-analyses. Results of meta-analyses showed no effect for PA.
Active Learning	Norris, Shelton, Dunsmuir, et al. (2015)	UK (England) and Australia	Systematic review	Any age group of school students	Eleven studies were identified: five examined PA outcomes only; three examined educational outcomes only; and three examined both PA and educational outcomes.	All studies found improved PA following active lessons: either in the whole intervention group or specific demographics. Educational outcomes either significantly improved or no different.

Table 1. Cont.

Area	Source	Countries of Authors	Type of Review	Age Phase	Sample	Key Findings
Active Recess	Broekhuizen, Scholten and De Vries (2014)	Netherlands	Systematic review	2–18 years old	Thirteen experimental and seventeen observational studies	Experimental studies generated moderate effects after the provision of play equipment, inconclusive evidence for use of playground markings, allocating play space and multi-component interventions. No evidence of increasing recess duration on health. Observational studies showed positive associations between equipment and PA level. Significant associations found between PA and decreased playground density and increased recess duration. density, the promotion of PA by staff.
Active Recess	Escalante, García-Hermoso, Backx, et al. (2014)	Spain and UK (Wales)	Systematic review	2–12 years	Eight articles met the inclusion criteria	The strategies had potential to increase PA during recess. Cumulative evidence was (i) interventions based on playground markings, game equipment, or a combination of the two, do not increase children’s PA during recess; (ii) interventions based on playground markings plus physical structures increase the PA of schoolchildren during recess in the short to medium term.
Active Recess	Ickes, Erwin and Beighle (2013)	US	Systematic review	Preschools and elementary/primary schools	Thirteen interventions represented both settings within the U.S and internationally	Strategies included: added equipment/materials, markings, zones, teacher involvement, active video games, activity of the week, and activity cards. Of included studies, 95% demonstrated positive outcomes as a result of the recess intervention.

Table 1. Cont.

Area	Source	Countries of Authors	Type of Review	Age Phase	Sample	Key Findings
Active Recess	Parrish, Okely, Stanley, et al. (2013)	Australia	Systematic review	5–18 years	Nine articles met the inclusion criteria	Inconclusive findings for all intervention types. Five studies demonstrated positive intervention effects on PA levels, with four reporting statistically significant increases and two reporting significant decreases in recess PA.
Active Recess	Reilly, Johnston, McIntosh, et al. (2016)	UK (Scotland)	Systematic review	Primary and high school children	Twenty-four eligible studies of primary school students; two eligible studies of high school students.	Recess made a small contribution to daily MVPA. Substantial policy effort is likely to be needed if recess is to make a more useful contribution to MVPA among children and adolescents.
Active Recess	Ridgers, Salmon, Parrish, et al. (2012)	Australia	Systematic review	5–18 years	Fifty-three studies	Positive associations were found between overall facility provision, unfixed equipment, and perceived encouragement and recess PA. Results revealed boys were more active than girls.
Active Transport	Larouche, Saunders, Faulkner, et al., 2014	Canada	Systematic review	5.0 to 17.9 years old	Sixty-eight studies	Active Transport users were more active inactive peers and interventions lead to increases in PA. All studies with relevant measures found a positive association between cycling to/from school and fitness.
Active Transport	Martin, Kelly, Boyle, et al. (2016)	UK (Scotland)	Systematic review and meta-analysis	Primary and Secondary aged students	Twelve studies	17 min per day MVPA accumulated walking to/from school in primary pupils; 13 min in high school pupils. Walking to/from school contributed 23% and 36% of MVPA on schooldays in primary school age children and high school pupils, respectively.

3.1.1. Active Breaks

Active Breaks are short duration (typically 5–15 min) sessions of PA, usually led by class teachers or other members of school personnel, during classroom-based lessons. Active Breaks can take various forms, and many curricula have been developed, tested, and disseminated, i.e., [22]. Teachers tend to combine pre-produced and self-developed activities. Some active break strategies involve stopping instruction for several minutes, asking students to stand or move elsewhere in the classroom, or having the teacher or a video lead a guided activity that involves movement. These activities' duration, intensity, and structure can vary considerably [23]. Active Breaks are unusual within the PA opportunities discussed in this report, as their implementation depends on decisions made by classroom teachers. Many classroom teachers do not have experience implementing Active Breaks, and the limited evidence indicates they are not widely used in primary school classrooms and barely in secondary schools [23].

Five systematic reviews or meta-analyses of Active Breaks met the inclusion criteria [18,24–27]. These reviews support the claim that Active Breaks increase children's PA levels. However, a relatively high number of studies reviewed were of low methodological quality. Except for the Irish program devised as part of Murtagh, Mulvihill, and Markey [28], existing programs have tended to have taken place in the US. Therefore, findings from these reviews should be interpreted with caution.

Several PA interventions have identified factors that mediate successful Active Breaks interventions, such as time, resource availability, and a supportive school climate might affect implementation [29]. Schools are also under performance pressure to achieve academic objectives, which often reduces PE time and PA opportunities [30]. Therefore, a successful school-based PA scheme should be integrated into the curriculum and the school day.

The Active Breaks discussed in the studies of this review varied in duration from 4 min to 20 min. Activities tended to focus on aerobic exercise (e.g., marching with arm movements, jogging, running, jumping, and hopping). There are numerous ways of applying Active Breaks in classrooms, such as using pre-packaged programs, video exercise guides, and/or creating and implementing their own strategies. Previously evaluated programs that have integrated Active Breaks found that they can promote PA, increase time on tasks and improve academic performance. Evidence suggests that well-designed active break programs can significantly impact children's PA. For example, one case study showed the incorporation of structured Active Breaks increased MVPA for preschoolers, accounting for 60–90% of time spent in MVPA at school [31]. Another study provided strong evidence that the Take 10! Program increased PA levels in children from 5–10 years old, in various contexts, in different countries. The review of empirical research based on the scheme reported at least a 13% increase in PA levels [32].

As with PA, in general, girls tend to be less active during Active Breaks than boys [33]. Girls spend less time in light PA (LPA) and MVPA and are more inactive than boys. However, possibly due to their lower baseline scores, girls respond better to active break interventions [33]. In addition, gender differences have been reported in delivery methodologies, with girls responding better to educational components based on social learning theory, while boys may be more influenced by structural and environmental changes facilitating increased PA [34].

Teachers are critical in implementing successful programs by demonstrating, motivating, and monitoring PA sessions [33]. Active Breaks can address the lack of some teachers' knowledge and support the positive role that activity plays in the learning environment. Empirical studies suggest Active Breaks are generally popular with both students and teachers. No evidence has been found that they necessarily interfered with classroom learning or affected student behavior detrimentally [32,35]. Teachers tend to prefer Active Breaks of relatively low intensity, seeing VPA Active Breaks as disruptive to their teaching [36], which is unfortunate as VPA is more beneficial in terms of both physical health and academic effects [37]. Some evidence suggests that frequent, short MVPA Active Breaks offer a feasible alternative to VPA breaks, leading to positive outcomes [38].

Overall, the evidence demonstrates that Active Breaks increase students' PA levels. Other reported benefits include healthier weight status, improved behavior, enhanced cognition, and greater enjoyment. As with other aspects of PA outcomes, the successful implementation of Active Breaks seems to depend on several contextual factors, including:

- Availability of relevant resources;
- Teacher and senior management support;
- Positive teacher attitudes [39].

A word of caution should be sounded, too. Many of the published studies on Active Breaks are of relatively low quality, and there is high variability in important design features, intervention methods, duration and intensity, and outcome measures. Therefore, further work in this area is needed. Nevertheless, Active Breaks seem a potentially valuable source of PA that enhances, rather than interferes with, wider educational outcomes.

3.1.2. Active Homework

Active Homework has been proposed as a possible way of promoting PA among students by extending the time available for schools to influence students' health behaviors [40]. Homework activities can be designed for students to apply and practice the skills learned in PE lessons and might take place at home (with or without parents' involvement) and in nearby sporting environments or facilities [41]. According to Kääpä, Palomäki, Vähä-Ypyä, et al. [40], students can find homework connected to PE lessons enjoyable and beneficial. For example, students reported positive responses to homework that included practicing with family members. In addition, it has been found that Finnish students enjoy participating in planning PE homework [40]. One part of the rationale of Active Homework is to encourage students to become familiar with their local environments and available facilities to help make PA part of their lifestyles [42].

The evidence base regarding Active Homework is limited. Only one short review of the literature has been carried out in this area [43], which included no relevant studies for this report. Three empirical studies were identified that examined the relationship between Active Homework and PA [44,45], but only one was based in Europe. The sole European study was concerned with Finnish adolescent girls in a journal of questionable quality and with neither controls nor pre-post measures [40]. Active Homework represented a small part of the students' whole-day PA, averaging 34 min per week. In total, 38% of the girls met the recommended levels of PA, which, in light of the mean PA results, implies that a substantial number of girls engaged in minimal PA (although this is not mentioned in the text), so the evidence base related to Active Homework is currently weak. It does seem a plausible strategy, but without credible research findings, the case for Active Homework is unproven.

3.1.3. Active Learning

The use of PA in a cross-curricular setting varies considerably. In some countries, PA stands relatively separate from other aspects of schooling, while in others, curriculum guidance makes the expectation of integration with other areas clear [46]. Many teachers report finding it difficult to win support for adding PA to the school day from colleagues and managers [36], and time constraints are often significant barriers to implementing new PA [47], often due to curriculum demands in key learning areas and associated academic accountability pressure [48]. Therefore, time-efficient PA promotion strategies that contribute to PA promotion without undermining academic achievement are valuable. Active Learning has been proposed as a plausible solution to this challenge.

There has been only one systematic review of the impact of Active Learning to date [49]. The authors aimed to investigate the methods used in interventions to promote PA through physically active lessons while maintaining academic time. All eleven studies in the review found improved PA following classes with Active Learning, either in the whole intervention group or in specific demographics. Educational outcomes either significantly improved or were no different compared with sedentary teaching.

Mathematics is the most common focus of studies investigating the effects of integrated PA on academic learning. However, First Language, Foreign Languages, Science, Geography, and general academic performance have also been investigated [50]. For example, Mullender-Wijnsma, Hartman, de Greef, et al. [51] developed active academic classroom lessons, primarily focusing on the repetition and memorization of reinforced concepts in mathematics and language. Overall, assessments showed increased on-task behavior and significantly higher test results (e.g., [52]).

These studies could be framed as a single hypothesis: children in Active Learning conditions outperform those in non-active conditions in both immediate and delayed tests. This hypothesis was supported by the literature, although it is unclear whether this is due to the integration of PA in classroom lessons or PA per se. Positive effects could simply be due to the wide variety in physical and cognitive development, which is typical with children. This was reflected in the high standard deviations in findings. Or perhaps results were affected by the different types, intensities, and levels of activity in which children in other conditions were involved and the relevance of those PAs to cognitive tasks.

Considered as a whole, these findings suggest that Active Learning is a cost-effective, enjoyable, and motivating strategy to increase students' daily PA at school without undermining other educational goals. On the contrary, the evidence suggests that effective Active Learning programs can enhance academic performance. The papers reviewed here reinforce the importance of acknowledging that positive outcomes from Active Learning do not happen automatically; they are most likely to be realized in association with a series of conducive 'change mechanisms'. The successful implementation of Active Learning is associated with proactive leadership and teacher support, teacher efficacy regarding mastering the programs, the ease of organizing Active Learning sessions, the genuine inclusion of Active Learning into lesson curricula, and children's positive reception of the intervention. Therefore, Active Learning will work most effectively when it is part of a whole-school approach to promoting PA in school.

3.1.4. Active Recess

Since it presents an opportunity to engage almost all students in daily PA in an environment that often includes space and facilities, recess has been identified as a potentially valuable setting for promoting PA [53]. Recent years have seen increasing interest in promoting children's PA during school recess using different strategies, including the introduction of playground markings and games equipment [54].

Six reviews were found related to the relationship between school recess and PA [54–59]. The reviews suggest that recess has the potential to contribute about 40% towards daily PA recommendations [54], and the school environment is a potentially valuable setting for PA initiatives, particularly schoolyards during recess [60].

Empirical studies suggest that Active Recess periods can contribute to improved fundamental movement skills, weight status, and cognitive performance (e.g., [61]). However, PA behavior during recess varies widely depending on the space in which recess takes place [62], facilities [63], gender [64], and social grouping [65]. Studies found that recess PA was associated with aspects of the school's physical environment; for example, large play spaces [66], adequate equipment [67], playground markings [68], and a clear division by activity type have been reported to be effective in promoting PA during recess [57]. There is some evidence that the physical environment factors that affect PA during recess differ by the culture or lifestyle of countries [69].

The systematic observation literature shows that the amount of MVPA during recess varies between 44% and 66% (e.g., [70,71]). Boys are generally more active than girls during recess, with boys typically spending about 50% of the time in MVPA [71]. Boys tend to play in larger groups than girls and engage more in sports activities, whereas girls primarily engage in sedentary play [67]. Girls tend to engage in more prosocial behavior than boys, whereas boys engage in more antisocial behavior than girls [71]. However, it needs to be acknowledged that there are inconsistent findings, probably due to the issue of different

recess characteristics (e.g., duration, supervision, environment) and definitions of recess used [72].

The playground as a site of PA has become the focus of research in this area [55]. It is known that PA behavior during recess can vary widely depending on space [62], gender [64], and social grouping [65]. A strategy that supports PA during recess is the introduction of sporting activities [73]. However, this is mediated by the type of activity [54]. Other factors associated with higher levels of PA during recess include active supervision, the participation of teachers and connection with PE lessons, students' positive perceptions of the playground environment, the accessibility of spaces and equipment, and the use of outdoor space [72]. In addition, supportive school policies are associated with increased PA during recess [74].

3.1.5. Active Transport

Walking or cycling to and from school has been proposed as a cost-efficient, sustainable source of regular, daily PA [75] that is less burdensome and costly than most leisure activities [76]. Almost all students need to make daily journeys to school, and, especially in the case of primary schools, the distances between home and school are generally manageable [10]. However, the prevalence of Active Transport has significantly declined in most countries over recent decades [77], with a few notable exceptions, including Belgium, Denmark, and the Netherlands [78]. Traditions of walking and cycling vary between European countries [79], which might help explain the current lack of knowledge about the effectiveness of intervention studies in the long term despite cross-sectional findings of the increased uptake of Active Transport when schools support the concept [80].

Across these different methods employed—accelerometry, pedometers, self-report—general patterns seem relatively consistent. For example, longer travel distances have been strongly connected to the decline in Active Transport, as an increase in the distance between home and school leads to fewer children walking or cycling [81]. However, those students who travel longer distances accrue more significant amounts of PA and health benefits [82]. The physical environment in which students live impacts their travel patterns [83,84]. Community density, diversity, and design have consistently been linked with personal travel behavior and are considered the most influential built environment factors in active travel [85]. Perceptions of street safety, the availability of pavements (sidewalks), crossings, general street connectedness, and commuting distance have been associated with more frequent active travel among students [86]. Some of these factors may be particularly problematic in rural areas, where safe street elements (e.g., pavements and bicycle lanes) are less common, and schools are often located far from students' homes [87].

Two systematic reviews examined the relationships between Active Transport and PA [88,89]. The former estimated the weighted mean MVPA from studies of walking to and from school to be 17 and 13 min or 23% and 36% of MVPA per school day in primary and secondary pupils, respectively. Almost all of the 68 studies in the latter review reported positive relationships between Active Transport and PA levels and positive associations with health outcomes. Furthermore, there is evidence of a dose-response effect, albeit mediated by the effects of gender and age, leading Larouche, Saunders, Faulkner, et al. [89] to conclude that Active Transport “should be promoted to increase PA levels in children and adolescents” (p. 206).

The empirical literature consistently reports that Active Transport is associated with increased levels of PA and higher levels compared with those using motorized modes of transport [89]. They are also more likely to meet daily PA recommendations [90]. For example, a study of Estonian and Swedish children and adolescents aged 9–10- and 15–16-years-old found generally higher levels of daily PA across all groups, especially in boys, and especially if cycling. A follow-on study with 10 European cities reported that Active Transport was positively associated with greater amounts of MVPA and overall PA, and this association was stronger in males than females [91]. Another multi-European-country study surveyed students in twenty-one primary schools in nine cities in seven European countries. Most

students in the sample used Active Transport, with 58% walking and 8% cycling to and from school, although there was considerable variation between cities. Larger cities tended to have low levels of car use, while those with warmer climates had even less. Other variables included parental shopping habits, perceptions of the local neighborhood, whether or not mothers work, and children's bicycle ownership [92].

Active Transport is a low-cost and sustainable behavior that could effectively increase PA for both girls and boys. The findings from high-quality studies demonstrated that those who walk to school increased the time engaged in MVPA. Similarly, those who cycle to school are more active than those who do not. Interventions to increase Active Transport are effective and sustainable. However, the current patterns of Active Transportation in Europe are cause for concern, and the levels of walking and cycling to school are decreasing.

3.2. Physical Education as a Setting

As for the setting of Physical Education, six relevant systematic reviews were identified (Table 2).

Table 2. Physical Education Settings at School—Systematic Reviews.

Area	Source	Country of Authors	Type of Review	Age Phase	Sample	Key Findings
Physical Education	Dudley, Okely, Pearson, et al. (2011)	Australia	Systematic	Primary and Secondary	Twenty-three articles met the inclusion criteria, published from January 1990 up to and including June 2010	Most effective strategies to increase primary children's PA and improve movement skill proficiency: prioritising direct instruction; prescribed curriculum; whole-school approach to PA; teachers with on-going professional development. For secondary schools: combination of prescribed PE/school sport curriculum with elements of student choice; substantial teacher professional development combined with sufficient teaching resources
Physical Education	Errisuriz, Golaszewski, Born, et al. (2018)	US	Systematic	Primary	Twelve relevant studies from 1991 to 2014	PE interventions consistently showed increases in MVPA or VPA during PE class, but less consistent in impacting leisure-time PA.
Physical Education	Hollis, Sutherland, Williams, et al. (2016)	Australia	Systematic	Secondary	Twenty-eight articles published between 2005 and 2014 from seven countries	Meta-analysis of 15 studies found students spent a mean of 40.5% of PE in MVPA. Middle school students spent 48.6% of the lesson in MVPA, and high school students 35.9%.
Physical Education	Hollis, Williams, Sutherland, et al. (2017)	Australia	Systematic	Primary	Thirteen articles published between 1991 to April 2014 from nine countries were included	PE lesson time spent in MVPA ranged between 11.4–88.5%. Meta-analysis of seven studies (four direct observation; accelerometers) found children spent a mean 44.8% of PE lesson time in MVPA.

Table 2. Cont.

Area	Source	Country of Authors	Type of Review	Age Phase	Sample	Key Findings
Physical Education	Lonsdale, Rosenkranz, Peralta, et al. (2013)	Australia	Systematic	Primary and Secondary	Fourteen studies met the inclusion criteria, up to March, 2012	Students in intervention conditions spent 24% more lesson time in MVPA compared with students in usual practice conditions. Increase could have a substantial positive influence on total PA accumulated. Professional learning focused on teacher pedagogy and behaviour offers potential for increasing youth PA.
Physical Education	Zhou and Wang (2019)	China	Systematic	Secondary	Fifty-five studies were identified (Forty-three judged to be medium and high quality by methodological quality assessment)	The variables consistently and positively associated with the MVPA: sex (boys); ethnicity (white); class gender (boys-only); PE activities (team games); lesson location (outdoors); expectancy beliefs; subjective task values; enjoyment Other variables were consistently and negatively related to MVPA: <ul style="list-style-type: none"> • Class gender (girls-only); • PE activities (movement activities); • Lesson context (knowledge).

Curriculum Physical Education Lessons

PE holds a unique position as a protected, regular, supervised context for the promotion of PA and constituent movement skills [93]. European countries have established time and other expectations for the provision of PE in schools, supported by formalized teacher education programs [94]. However, despite policymakers explicitly acknowledging the importance of PE, there is a widely shared concern that its potential benefits have rarely been realized [94], raising doubts about the value of PE as a critical source of PA. Identified challenges include:

- PE is generally considered to be a low-status subject;
- There are significant differences between policy expectations and implementation in schools, so even when the subject is a compulsory part of the curriculum, it is sometimes not taught at all;
- The greatest time allocation generally occurs when the children are aged 9–14, and allocated time declines as the students get older;
- Limited resourcing means many schools are unable to deliver a comprehensive or even coherent curriculum;
- Specialist teachers during the primary phase are rare in Europe;
- Equity, especially regarding gender and disability, means that many children are marginalized from quality PE experiences or excluded completely [95].

These problems are compounded by research suggesting that the benefits of PE are at least as dependent on the quality of pedagogy as participation in the activities themselves [96].

Six systematic reviews of the scientific literature related directly to the question of PE's contribution to students' PA [11,12,97–100]. Findings among these reviews were somewhat inconsistent, possibly due to the conflation of age phases. However, meta-analyses of non-intervention studies by Hollis of primary [11] and secondary school [12] settings reported that, overall, students spent a mean 44.8% and 40.5% of PE in MVPA, respectively.

It has been suggested that students should participate in MVPA for 50% of PE lesson time to gain appropriate health and educational benefits [101,102]. Based on the evidence provided by the reviews and empirical studies, it is reasonable to conclude that most PE lessons do not achieve this standard. In this regard, a pair of Australian systematic reviews are particularly relevant [11,12]. The review of studies with primary-aged students reported a very wide variation of measures of time spent in MVPA (between 11.4–88.5%). Still, the detailed meta-analysis found children spent a mean 44.8% of PE lesson time in MVPA [11]. The secondary-phase review reported that middle school students spent 48.6% of the lesson in MVPA and high school students 35.9%, suggesting declining PA levels as students progress through school. Their meta-analysis found that children spent a mean 44.8% of PE lesson time in MVPA. Significantly, there is compelling evidence that it is possible to increase the levels of PA in PE lessons. Dudley, Okely, Pearson, et al.'s [97] review identified several actions characteristic of effective PA promotion, including direct instruction and whole-school approaches. Direct instruction was also highlighted as a teaching strategy associated with higher levels of PA by Guijarro, Rocamora, González-Víllora, et al. [103]. There is some evidence that adopting model-based and teacher-led pedagogies can contribute to enhanced PA for both boys and girls [103]. When one study tested the impact of lesson content and gender on PA simultaneously, the impact of gender was no longer significant [104]. This suggests that the gender difference in PA levels can be rooted in different lesson content for gender groups. Swedish researchers found that some ways of organizing PE lessons, such as playing games, fitness, and orienteering, were inclusive of most students and capable of helping them reach as much as 72% of the daily target of 60 min of MVPA [105]. Developing lesson strategies to foster consistency in student engagement in PE, especially in reducing sedentary behavior and increasing MVPA, could substantially affect overall PA levels.

It has been suggested that all lessons should involve at least 50% of MVPA engagement. Many lessons failed to meet this target. Where data were available about lesson content, it was evident that PA levels were significantly affected by the types of activities included in lessons. Sporting games seem to be especially valuable in promoting MVPA. Reconsidering the activities offered to girls and boys appears necessary to develop inclusive, equitable PA opportunities.

3.3. Sports as a Settings

As for the setting of School Sport, four relevant systematic reviews were identified (Table 3).

Table 3. School Sport Settings at School—Systematic Reviews.

Area	Source	Country of Authors	Type of Review	Age Phase	Sample	Key Findings
School Sport	Atkin, Gorely, Biddle, et al. (2011)	UK	Systematic review	School students less than 18 years of age	Ten papers, reporting nine studies	Three studies reported positive changes in PA and six indicated no change. Evidence suggests that single-behaviour interventions may be most effective during these hours.

Table 3. Cont.

Area	Source	Country of Authors	Type of Review	Age Phase	Sample	Key Findings
School Sport	Demetriou, Gillison, McKenzie (2017)	Germany, UK, US	Review of reviews	School- aged children or adolescents up to and including 19 years		Better outcomes when conducting programmes in school rather than community settings, providing sessions on two or more days a week, and ensuring high attendance rates. Girls were more receptive than boys to intervention that promoted weight control. Some benefits for increasing PA levels among overweight students, especially boys. Only modest support for benefits of after- school programmes on child and adolescent PA levels and body composition.
School Sport	Houle, Gilbert, Paiement, et al. (2020)	Canada	Systematic review	Adolescent girls aged 11 to 17	Seventeen quantitative and qualitative studies describing ten different PA programmes	No clear improvements in PA levels or other physical outcomes. Some evidence that programmes could improve dimensions of self-esteem construct. Effectiveness of afterschool interventions varied considerably and comparisons between studies limited by different methodological study designs. Analyses within a small minority of studies revealed significant benefits in overweight/obese children and boys. Lack of convincing evidence interventions based on theories of behaviour change were more effective than those with no underlying theory
School Sport	Mears and Jago (2016)	UK	Systematic review	5–18 year olds	Fifteen articles; six studies were eligible for meta- analysis	

School Sports

Afterschool programs have become increasingly popular in many countries by extending the reach of the school day in areas considered either particularly important or where additional time might address shortfalls during the typical school day. HEPA-based schemes seem to meet both criteria, and the period immediately following compulsory schooling has been proposed as an under-utilized opportunity [106]. There is no single accepted definition of what constitutes an afterschool PA program. Still, it is generally assumed that they include supervised activities directly after school, usually on school premises and open to all children [107]. However, they could be based in community settings, often through collaboration between schools and community organizations. Sports or other forms of PA are sometimes the sole focus of these programs, but it is usually only one component of a multifaceted extracurricular program [107].

While PE and other in-school programs can effectively increase PA, discrete elements seem incapable of providing sufficient opportunities for students to achieve the recommended amounts of MVPA. In addition, theory-based interventions, which have focused on complex intra-personal (e.g., autonomy, self-efficacy) and inter-personal (e.g., peer social support)

processes mediating PA behaviors, have generally had little influence on PA levels [108]. One analysis found that PA interventions directed at students have produced an effect of approximately four more minutes of MVPA per day [109]. Afterschool programs offer a pragmatic supplement to these interventions by providing an opportunity to expand, extend, and enhance time for PA [110]. European data about the current uptake of afterschool sports programs are limited, and the available evidence suggests wide variability.

The concept of the Active School might be a partial solution to the exclusionary nature of sports forms, with its captive audiences, and the possibility of linking sports participation with broader health-related practices. The evidence base for such claims is generally limited [111]. However, recent reviews have shown the beneficial effects of participation in sports, including competitive sports, on overall PA levels [112]. There is also evidence of a dose-response effect between the number of sports sessions per week and the quantified beneficial health outcomes [113]. Therefore, while some have questioned the direct impact of sports participation on PA levels [114], it seems that playing sports can favor a broad spectrum of development for overall physical fitness, along with motor competence, that has been shown to predict overall PA levels [115]. PA that involves intermittent action and movement of the whole body is especially important for health outcomes [116], perhaps because they mirror the natural movement patterns of students. These types of movements are common in competitive sports such as football, basketball, forms of dance, and unstructured PA play.

Three reviews were identified that examined school sports as a setting for the promotion of PA. Two systematic reviews came from the UK [117,118], and a review of reviews from Germany/UK/US [107].

Each of these reviews reported findings that afterschool sports programs were associated with increased levels of PA. However, caution is advised due to methodological variability and quality, including the use of research methods that might be inappropriate for children, such as self-report measures. There has been an increasing tendency towards using objective measures of activity, such as accelerometers and direct observation [119]. Using accelerometry, Machado-Rodrigues, Coelho-e-Silva, Mota, and colleagues [120] estimated that Portuguese players accrued between 11% to 13% of total daily energy expenditure in organized sports, corresponding to 35% to 42% of the MVPA of daily energy expenditure. Similar findings were reported with footballers from France, Greece, and England [121] and female netball, basketball, and football participants [122]. These studies suggest that sports might have the potential to increase levels of PA and be effective in reducing bouts of inactivity or sedentary behavior. Observational studies also suggest that school sports can contribute substantial amounts of MVPA [123].

It should be acknowledged that many of these studies also recorded large amounts of either sedentary or light-intensity activity. Some studies show that children spend up to 70% of their time engaged in either inactivity or minimal activity. Obese students tend to be less active than their normal-weight peers during sports [124], and girls engage in higher levels of MVPA during training sessions than in competition [122]. Psychological factors probably also affect PA engagement, and numerous studies have highlighted the influence of perceptions of competence, autonomy, self-efficacy, and enjoyment within activity settings [125]. Furthermore, teachers, coaches, and other adults often base lessons on technical development and competition preparation, which are usually at sub-MVPA levels [126].

School sports can make a potentially valuable contribution to PA, but this is unlikely to meet the daily target of one hour per day for most students. A great deal depends on the activities undertaken during afterschool sessions. Competitive sports such as football seem to deliver the greatest MVPA and VPA. However, other forms of activity, such as cooperative games and PA play, may be more suited to supporting different outcomes, such as interpersonal skills, motor skill development, and inclusive engagement.

School-based clubs and programs have many of the advantages of other elements of Active Schools, such as appropriate facilities, a safe and familiar environment, a captive

population, and often the involvement of qualified teachers. However, since they are voluntary, these activities tend to be less successful at reaching the hardest-to-reach groups of students. Specially designed interventions are effective with groups such as girls and the overweight/obese. The evidence discussed here, therefore, shows potentially important contributions, but none of these should be accepted as given; the choice of activities, the way they are presented and supervised, and the underlying ethos of the school sports clubs and programs are of fundamental importance in determining any effects they have on students.

4. Conclusions

Due to the widespread problem of sedentarism and the sustained advance of obesity among children and adolescents, regular PA has become a public priority. Today's generation of children is the least active in history. To effectively address such high levels of concern, schools have been identified as key settings for promoting MVPA and reducing sedentary time. However, for most European students, schools are still the settings of the most sedentary parts of their day. Data from longitudinal studies with objective measures of PA suggest that the standard model of a school is poorly suited for the promotion of PA as MVPA begins to decline and sedentary behavior begins to increase from around the time young children first enter schools [127]. Consequently, policymakers and practitioners should consider investing in Active School concepts such as promising resources and opportunities for school students to be engaged in PA.

In addition to the self-evident value of improving children's and young people's well-being and combating factors associated with the reduced quality and length of their lives, embedding physical activity within all aspects of school life can positively support academic performance and achievement in a relatively low-cost and sustainable way [26]. It may also help to reduce transport's major contribution to global CO₂ emissions [128]. Schools have several distinctive characteristics that mean they are well-placed to act as foundational settings for the promotion of "sustainable physical activity" [129], as well as wider sustainability goals:

- Schools can reach almost all children, and have long-term, in-depth contact with them, creating a unique opportunity to reach a wide range of children across the population, regardless of social background [130];
- This contact happens during a crucial period of development, during which many health-related behaviors and interests are formed which can be carried forward into later life [131];
- Schools present a unique setting for integrating PA with other sustainability related messages [132];
- Schools, especially primary schools, often act as hubs of community activities, creating a focal point for sustainable PA opportunities, both directly (by organizing school-based learning experiences), and indirectly (by encouraging appropriate activities at home, in the neighborhood, and during commuting to and from school) [133];
- Integrating PA, health, and other sustainability related materials into school lessons is likely to a significantly lower economic cost to local and national agencies that introduce such content in extracurricular contexts.

Each of the settings of Active Schools discussed in the present review have the potential to add time to PA, although it seems that none will be able to do this alone. The positive effects of many of the items characterizing an Active School concept are based on rigorous scientific evidence; others still require further research. PA settings at school, such as Active Breaks, seem to increase students' PA levels but depend on numerous contextual factors. More reliable research findings are needed to support the influence of Active Homework on children's PA. Positive outcomes from Active Learning will only work successfully as part of a whole-school concept. Inconsistent findings about Active Recess call for additional clarifications. Furthermore, Active Transport to and from school needs to be encouraged as current patterns are a cause for concern due to decreasing levels of walking and cycling, and a shift towards greater car use brings with it considerable harm

to the environment. In light of the considerable variation in Active Transport opportunities in different parts of Europe, further research might profitably narrow its focus on specific countries' policies, infrastructure, and practices. Additionally, and in the context of PE, the present review reveals that most lessons need to increase the level of MVPA and enhance students' engagement to strongly affect overall PA levels. Finally, School Sports can also positively impact PA depending on the activities and the underlying ethos of the school sports clubs and programs.

The Active School concept is called on to maximize student benefits by combining two substantial effects related to the promotion of PA, and the participation and the interaction of all factors. By adding moments of engagement in PA throughout the school day, from relatively brief and LPA bursts from Active Learning to longer periods, including MVPA and VPA, in PE and school sports, Active Schools should contribute to the integration of PA in all aspects of school time and life beyond school. By combining positive early PA experiences, as well as the development of appropriate knowledge (e.g., of the rules of games), skills (e.g., basic movements), attitudes (e.g., positive feelings towards PA, importance of intrinsic motivation for sustained participation in PA), and values (e.g., believing PA is important), sustained participation in PA would be guaranteed. Active Schools aim to increase the quantities of PA, but this is most likely to happen when attention is also paid to the quality of those PA experiences. Thus, the multifactorial nature of an Active School concept offers a holistic presentation of these competencies such that, when done well, the whole is greater than the sum of its parts.

The so-called 'whole-school concept' underlines the need to focus on school-level change, the role of each key stakeholder group (e.g., teachers and teacher educators, parents, school leaders, health specialists) and the social and physical environments (e.g., engagement and support among stakeholders, playground, green space), not only the interventions within the mentioned chances for promoting PA among youth.

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