HEPAS

HEALTHY AND PHYSICALLY ACTIVE SCHOOLS IN EUROPE

An International Review of the Contributions of School-based Physical Activity, Physical Education, and School Sport to the Promotion of Health-enhancing Physical Activity

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Executive Summary

This Report

1. This report presents a series of reviews of the scientific literature to summarise the current evidence of the contributions of different school-based settings on the promotion of health-enhancing physical activity.
2. The objectives of this report are: to review evidence from the last ten years of the contributions of school-based physical activity, physical education, and school sport on the promotion of health-enhancing physical activity; to consider the role of certain transversal factors in supporting the promotion of health-enhancing physical activity; to present a series of practical, evidence-based recommendations in support of the subsequent activities in the HEPAS project.
3. The settings are: Physical activity (including Active Breaks; Active Learning; Active Recess; Active Transport; Active Homework); Physical Education (Curriculum physical education Lessons; Teacher Education / Workforce); and School Sport. The settings are supplemented by a set of 'transversal categories', which represent mediating factors for effective realisation of the promotion of health-enhancing physical activity are: Inclusion and Diversity; Continuous Professional Development; Facilities, Equipment and Resources; Community Partnerships; and School Events, Project Weeks, Camps.

Health and Physical Activity

4. Physical activity's benefits can be understood in terms of physical, developmental, psychological, cognitive, and social health, as well as academic achievement.
5. Despite the fact that physical activity is acknowledged to be an important part of healthy functioning and well-being, there is evidence that large numbers of youth are inactive to the extent that they are compromising their well-being, both now and in later life. In fact, schools are among the most sedentary environments for children and young people.
6. Public health entities throughout the world have advocated an increase of physical activity opportunities for children and young people through comprehensive or whole-school approaches, with access to the largest possible population, and the only societal institutions in which a very large proportion of youth can be reached.
7. In an Active School, all of a school's components and resources operate in a coordinated and dynamic manner to provide access, encouragement, and programmes that enable all students to engage in 60 minutes or more of physical activity each day.
8. Without opportunities to develop a foundation of movement skills and to experience a variety of physical activity experiences, children and young people will be severely restricted in their

capability to engagement in different forms of physical activity, both at that time and throughout the life course.

9. School-based interventions have been found to have significant effects on young people's physical activity and sedentary behaviours, although the effects have varied considerably. The key variable in determining the positivity and scale of the outcomes of participation in physical activities is the social environment in which they take place.
10. A range of factors influence teachers' engagement with health-related issues, such as professional preparation, competing pressures from other stakeholders, curriculum and assessment requirements at the policy levels, and personal knowledge, skills, attitudes, and values.

The Settings

11. Active Breaks are relatively brief bouts of physical activity, usually led by a teacher during classroom lessons. Evidence shows Active Breaks increase students' physical activity levels, as well as contributing to healthier weight status, improved behaviour, enhanced cognition and greater enjoyment. The number and quality of studies in this area suggest that the evidence in favour of Active Breaks is STRONG.
12. Active Homework, in which students carry out physical activity-related practices after school, is a potentially useful way of increasing physical activity. The small number of identified studies report positive outcomes from Active Homework for both girls and boys, although effects tended to be relatively small across the school week. Due to the small number of studies and limited methodologies used, the evidence for Active Homework is rated as WEAK.
13. Active Learning refers to the strategy of integrating physical activity into classroom lessons, across the school curriculum. The findings reported here demonstrate that Active Learning is a cost-effective, enjoyable, motivating strategy to increase students' daily physical activity at school without undermining other educational goals. On the contrary, the available evidence suggests Active Learning often enhances other educational outcomes. Assuming proactive leadership, teacher support, and teacher efficacy, the case for Active Learning is STRONG.
14. Active Recess, promoting physical activity during the non-curricular time allocated by schools between lessons, promises to add a significant amount of activity to all European schools. Effective Active Recess strategies have been found to provide up to 40% of students recommended daily physical activity, with greater benefits going to younger children and boys. There is a growing high-quality scientific literature on Active Recess, although this research is of variable quality. There has been no European-level evaluation of the concept. The evidence for Active Recess is rated as MODERATE.

15. To be added Active transport to and from school, such as walking or cycling, has been proposed as an important source of daily physical activity. Research demonstrates that walking and cycling to and from school are associated with increased moderate-to-vigorous-physical-activity, and Active Transport interventions are effective. Due to the quality and number of the scientific papers informing this domain, Active Transport is judged to be STRONG.
16. Physical education has a unique position in school-based physical activity promotion as the only protected, regular, supervised setting for physical activity during the school day. Students are more active during physical education lessons than in any other context, but generally fail to reach a target of 50% of lessons at moderate-to-vigorous-physical-activity. Due to the relatively large number of reviews and empirical studies in this area, publication quality, and consistency if findings, physical education is rated STRONG.
17. Physical education teacher education and workforce training are vital elements in the implementation of effective practice, and this may be especially the case when innovations are introduced.
18. No directly relevant reviews or empirical studies were identified to inform discussion of this topic, and the only indirectly related article reported limited impact of professional training in health-enhancing physical activity promotion. In light of the poor evidence base, Teacher Education and Workforce is rated WEAK.
19. School sport, especially after school, has been a popular setting of physical activity, despite cautious support from policy-makers. The studies reviewed in this section suggest that sporting activities, both competitive and non-competitive, can increase both moderate-to-vigorous-physical-activity and vigorous-physical activity, especially if played multiple times during the week; however, attention needs to be paid to the needs of girls and overweight/obese students, who are heightened risk of exclusion. There have been numerous studies of the relationship between school sport, including some of high quality, and their findings are relatively consistent, leading to the rating of STRONG.

Glossary

Due to its subject matter, this document occasionally refers to technical, medical or scientific terms. These are explained in the following table.

Accelerometer	A device that detects and quantifies physical activity and movement via an electronic sensor. Records body acceleration minute to minute, providing detailed information about the frequency, duration, intensity, and pattern of movement. The data provided often are used to estimate energy expenditure (Hausenblas & Rhodes, 2017).
Active Breaks	A short bout of physical activity performed as a break from academic instruction to increase or decrease students' activation (Eu-PALS Project, 2019).
Active Homework	… promote participation in physical activity at home by assigning homework that students can do on their own or with family members (CDC, 1997).
Active Learning	The use of Physical Activity Lessons in which curriculum topics are delivered through movement (EuPEO Project, 2018).
Active Recess	The dedicated break time for school-based children to engage in spontaneous play (self-organised) or in structured play (active) ... but out of the formal subject-content curriculum (EuPEO Project, 2018).
Active Transport	… incorporates all modes of transport relying on human power for propulsion (Interreg Europe, 2019).
BMI (Body Mass Index)	… a measure of weight relative to height (WHO, 2019).
Cognitive load	The load on working memory during problem solving, thinking and reasoning (including perception, memory, language, etc.) (Sweller, 1988).
Community partnerships	Practices to include families and communities in educational processes (Paik, Choe, Kang, et al, 2019).
Continuous professional development	Professional growth of teachers involved in teaching. These can include formal training, collaborative practice, coaching, mentoring, peer review, reflective practice, enquiring practice, action research, etc. (OECD, 2030, 2018).
Dose-response effect	In physical activity, this is the relationship between the amount of PA and the overall health outcome (Kohl, Murray & Salvo, 2019).
Executive functions	An individual's ability to initiate, adapt, regulate, monitor, and control information processes and behaviour (Diamond, 2013).
Exercise	Exercise (also referred to as exercise training) is a subcategory of physical activity that is planned, structured, repetitive and purposive, with the goal to improve or maintain one or more components of physical fitness, performance and health (WHO, 2010).
FMS (Fundamental Movement Skills)	The building blocks that lead to specialized movement sequences required for adequate participation in many organized and non-organized physical activities for children, adolescents and adults (Lubans, Morgan, Cliff, et al, 2010).

Grey Literature	Research that is either unpublished or has been published in non-commercial form. Examples of grey literature include: government reports. policy statements and issues papers (University of New England, 2020).
Health-enhancing PA	PA that, when added to baseline activity, produces health benefits (U.S. Department of Health and Human Services, 2018).
Inclusion	A process of addressing and responding to the diversity of needs of all learners through increasing participation in learning, cultures and communities, and reducing exclusion within and from education. It involves changes and modifications in content, approaches, structures and strategies, with a common vision which covers all children of the appropriate age range and a conviction that it is the responsibility of the regular system to educate all children (UNESCO, 2005).
LPA (Light Physical Activity)	Those activities that require standing up and moving around. Examples include Moving around a classroom, Working at a standing workstation (Australian Government, Department of Health, 2019).
METs (Metabolic Equivalent)	The ratio of the work metabolic rate to the resting metabolic rate. One MET is defined as 1 kcal/kg/hour and is roughly equivalent to the energy cost of sitting quietly. A MET also is defined as oxygen uptake in ml/kg/min with one MET equal to the oxygen cost of sitting quietly, equivalent to 3.5 ml/kg/min (Ainsworth, Haskell, Leon, et al, 1993).
MVPA (Moderate Vigorous Physical Activity)	Activities that require some effort but it is still possible to talk while doing them. Examples include Brisk walking, Recreational swimming, Social tennis (Australian Government, Department of Health, 2019).
NCDs (Non-Communicable Diseases)	A disease that is not transmissible directly from one person to another. Commonly known as chronic or lifestyle-related diseases, the main non-communicable diseases are cardiovascular diseases, diabetes, cancers and chronic respiratory diseases (United Nations, 2011).
PA (Physical Activity)	Any bodily movement produced by skeletal muscle that requires energy expenditure (WHO, 2010).
PE (Physical Education)	Structured, supervised PAs that take place at school and during the school day (Bailey, 2006).
Pedometer	… detect the vertical force associated with each step and the output (number of steps taken) (Kohl & Cook, 2013).
Physical Fitness	A set of attributes that are either health- or skill-related. The degree to which people have these attributes can be measured with specific tests (Casperson, Powell & Christenson, 1985).
Physical Inactivity	Not meeting the applicable PA recommendations (WHO, 2010).
Professional Development	… the professional growth a teacher achieves as a result of gaining increased experience and examining his or her teaching systematically (Glatthorn, 1995).

School sport	School Sport is the structured learning that takes place beyond the curriculum (i.e. in the extended curriculum) within school settings; this is sometimes referred to as out-of-school-hours learning (Harris, 2016).
Sedentary behaviour	Any waking behaviour characterised by energy expenditure ≤ 1.5 METs, while in in a sitting, reclining or lying position (Tremblay, Aubert, Barnes, et al, 2017).
Systematic review	Answers a defined question or a set of questions, using pre-specified eligibility criteria and a structured and clearly documented methodology to minimise bias when identifying and collating the evidence (European Centre for Disease Prevention and Control, 2020).
Teacher education	… designed to equip teachers with the knowledge, attitude, behaviour and skills required for teaching at the relevant level (UNESCO Institute for Statistics, 2020).
VPA (Vigorous Physical Activity)	The activities lead to harder breathing, or puffing and panting (depending on fitness), such as Aerobics, Jogging, Many competitive sports (Australian Government, Department of Health, 2019).

1. Introduction

Schools are expected to fulfil many different roles and functions, but most would probably agree that two ambitions are central: development of students' well-being, and the knowledge, skills, attitudes, and values that are likely to encourage a happy and successful life (De Ruyter, 2015; Kristjánsson, 2019). Curriculum content has developed to support the constitutive elements of these ambitions, and among them physical education (PE), sport, 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 (McNamee & Bailey, 2009). This situation changed significantly in recent years as falling levels of PA have led international agencies, such as the World Health Organisation (WHO) and the United National Educational, Scientific and Cultural Organisation (UNESCO), as well as national governments and agencies, have started to sound calls of alarm about rising incidents of non-communicable diseases, like Type 2 diabetes, heart disease, and obesity.

Despite the fact that regular PA is near-universally acknowledged to be an important part of children's and young people's healthy functioning and well-being, 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 (Kohl, Craig, Lambert, et al, 2012). The trend towards sedentary lifestyles across almost every developed country, and increasingly across the developing world is a source of considerable concern (Hallal, Andersen, Bull, et al, 2012). The causes of this trend are complex, but there is little doubt that an important factor is the compound effects of industrial, automotive and information technology innovations, which have resulted in radical changes to the ways in which people carry out their daily tasks. Modern societies are WEIRD (Henrich, 2010):

Despite the fact that physical activity is acknowledged to be an important part of healthy functioning and well-being, there is evidence that large numbers of youth are inactive to the extent that they are compromising their well-being, both now and in later life.

- Western
- Educated
- Industrialised
- Rich
- Democratic

WEIRD societies have become organised in ways that are incompatible with human's evolved biology, and they are paying the price. The effects of some of these developments, such as computers and trains, have directly impacted on levels of PA, whilst others, such as televisions, computers and electronic entertainment are indirect and more ambiguous (Bailey, 2018b). The emergence and ready availability of new technologies has exaggerated these changes on physical labour and human energy expenditure. The consequences of living in WEIRD societies can be considerable, including reduction to the quality and length of lives, as well as considerable economic and health costs.

Public health strategies require access to the largest possible population, and schools are the only societal institutions in which a very large proportion of youth can be reached.

There have been other factors influencing the changing state and status of PA in schools. In some countries, for example, the lure of sporting success has motivated increased investment (Grix & Phillpots, 2015). In others, sporting activities have been promoted as vehicles for developing stronger social connectedness (Hellison, 2011). However, there seems little doubt that the main international concern that has driven discussions of the promotion of children's and young people's PA has been concerns for the health and economic consequences of an "inactivity pandemic" (Kohl, Craig, Lambert, et al, 2012).

In this context, schools hold a unique role. Public health strategies require access to the largest possible population, and schools are the only societal institutions in which a very large proportion of youth can be reached. In addition, schools have an established role in communicating vital messages, whilst connecting with an extended network of parents, families, and communities. They also deal with people at an early stage, when their behaviours and values are still being shaped (Aston, 2018). Compulsory schooling coincides with a window of opportunity for affecting the knowledge, skills, attitudes, and values associated with PA. It makes sense, therefore, that their remit to support students' well-being will be expected to respond to the increasing alarm about inactivity.

A whole-school approach … focuses on reorienting school systems toward health promotion through embedding health and well-being in the curriculum, creating healthy social and physical environments and engaging with parents and the wider community.

European engagement with coordinated, school-based health promotion can be traced to the 1980s, when the World Health Organization (WHO), the European Commission, and Council of Europe developed the concept of the 'health-promoting school', based on the principles and strategies of the Ottawa Charter for Health Promotion (WHO, 1986). Central to this initiative was the notion that schools serve as effective settings to promote the health and well-being of all people in the communities associated with school life (Viig & Wold, 2005). This collaboration led

to the establishment of the European Network of Health Promoting Schools, partnership that continues to this day.

While specialist agencies have called on schools to create cultures of health where youth have opportunities to engage in and learn about healthy lifestyles, implementing this culture in practice has often proved a challenge for various reasons (Centeio, Barcelona, Kaszeta, et al, 2018). Subsequent research suggests that whole school, multi-component interventions are most effective when key stakeholders are empowered to commit and make the interventions sustainable (Langford, Bonell, Jones, et al, 2015). Many of the models of healthy schools as hubs of health promotion build on the groundwork laid down by the WHO's Health Promoting School framework (2020), and its aim of "a whole-school approach, and focuses on reorienting school systems toward health promotion through embedding health and well-being in the curriculum, creating healthy social and physical environments and engaging with parents and the wider community" (Bartelink, Van Assema, Jansen, et al, 2019, p. 2). The US 'Whole School, Whole Community, Whole Child' (WSCC) model is, perhaps, the most widely disseminated approach, highlighting the dynamic relationship between intrapersonal, interpersonal, and community levels. It highlights the importance of evidence-based school policies and practices, and explicitly identifies 10 'components' of an effective school-based health-promotion strategy (including PE respond to the increasing alarm about inactivity and PA, Nutrition environment and services, Social and emotional school climate, and Community involvement) (ASCD & CDC, 2014). These components reiterate findings from other studies demonstrating the importance of the inclusion of specific activities and practices that can act as focal points for leveraging the promotion of healthy and active lifestyles in schools (Storey, et al, 2016).

This report presents a series of reviews of the scientific literature to summarise the current evidence of the contributions of different school-based settings on the promotion of health-enhancing PA. It uses what are sometimes called 'rapid reviews', which follow most of the protocols of the standard approaches, such as systematic reviewing, but with greater flexibility and speed. The report is prefaced by discussions of the contemporary importance of PA for children, young people and society. It also considers the relevance of schools as setting for the promotion of PA.

The objectives of this report are as follows:

- To review evidence from the last ten years of the contributions of school-based PA, PE, and school sport on the promotion of HEPA;
- To consider the role of certain transversal factors in supporting the promotion of health-enhancing PA;

- To present a series of practical, evidence-based recommendations in support of the subsequent activities in the HEPAS project.

The settings are:

Physical activity	• Active Breaks • Active Learning • Active Recess • Active Transport • Active Homework
Physical education	• Curriculum PE lessons • Teacher Education / Workforce
School sport	

The transversal categories are:

- Inclusion and Diversity;
- Continuous Professional Development;
- Facilities, Equipment and Resources;
- Community Partnerships;
- School Events, Project Weeks, Camps.

The meanings of these terms are explained as they arise in the text. In addition, a glossary is offered at the end of the report in which each of these phrases, and other significant concepts, is defined.

2. Health-Enhancing Physical Activity in Childhood and Youth

2.1. The Importance of Physical Activity

The relationship between PA and physical health is now established beyond doubt, and awareness of the health costs of sedentary behaviours is so advanced among scientists and policymakers that inactivity is now recognised as a major public health concern (Ding, Varela, Bauman, et al, 2020; Sallis, Cerin, Conway, et al, 2016). Worldwide, more than 1.4 billion adults do not reach recommended levels of PA and are, therefore, at greater risk of developing non-communicable diseases (NCDs), such as cancer, heart disease, stroke, and diabetes (Guthold, Stevens, Riley, et al, 2018). The global pandemic of physical inactivity (Kohl, Craig, Lambert, et al, 2012) is

The global pandemic of physical inactivity is responsible for more than 5 million deaths, and at least €61.5 billion of economic burden per year.

responsible for more than 5 million deaths (Lee, Shiroma, Lobelo, et al, 2012), and at least €61.5 billion of economic burden per year (Ding, Lawson, Kolbe-Alexander, et al, 2016). In 2010, the WHO estimated that physical inactivity was the fourth leading risk factor for global mortality. While there are some persistent challenges in terms of the validity and comparability of data on levels of PA across Europe, recent statistics from Member States of the EU indicate that 60% of citizens above 15 years of age never or seldom exercise or play a sport, and more than half never or seldom engage in other kinds of PA, such as cycling, dancing or gardening. In addition, activity levels generally decline and sedentary behaviours increase as people get older (European Commission, 2018). Physical inactivity has been estimated to be responsible for at least 10% and 9% of all-cause mortality in North American and in European countries, respectively (Lee, Shiroma, Lobelo, et al, 2012).

Physical activity's benefits can be understood in terms of physical, developmental, psychological, cognitive, and social health, as well as academic achievement.

In contrast, accumulating sufficient Moderate to Vigorous Physical Activity (MVPA) is a key determinant of physical, mental, social, and environmental health (Bull, Gauvin, Bauman, et al, 2010). Among children and youth (aged 5–17 years), several systematic reviews have reported PA benefits in terms of physical, developmental, psychological, cognitive, and social health, as well as academic achievement (Greier, Ruedl & Drenowatz, 2019; Janssen & LeBlanc, 2010; Lubans, Richards, Hillman, et al, 2016; Singh, Saliasi, Uijtdewilligen, et al, 2019). The most comprehensive recent review of the benefits associated with regular PA identified more than 200 discrete outcomes, which were organised into 6 general themes or 'capitals': physical, social, emotional, individual, intellectual, and financial (Bailey, Hillman, Arent, et al, 2013).

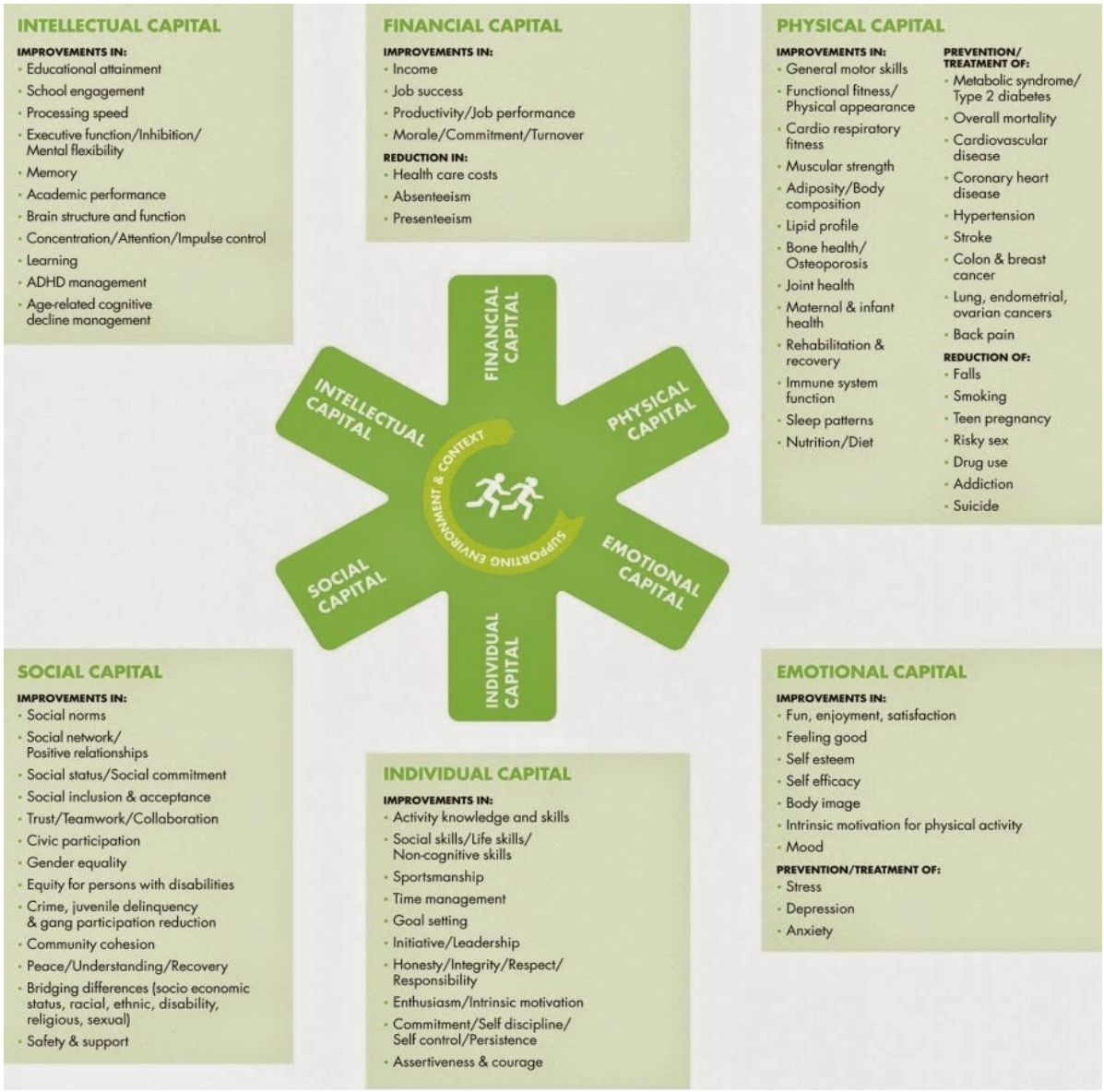


Figure 1: The Human Capital Model (Bailey, Hillman, Arent, et al, 2013)

Since most forms of PA are either free or at little cost, and lead to a wide-range of health gains, the consensus within the scientific community that they are cost-effective public health priorities in terms of their effect on the direct and indirect costs related to disease, as well as wider outcomes, seems justified.

2.2. How Active are Children and Young People?

Despite these benefits, it has been estimated that 80% of 11–17-year olds worldwide do not reach the minimum recommendation of 60 minutes of MVPA per day (Sallis, Bull, Guthold, et al, 2016). The low levels of PA among children and adolescents in the European Union are alarming and have become a

matter of great concern for policymakers, since physical inactivity is responsible for over 500,000 deaths per year and account for considerable economic costs (European Union, 2016). PA levels have declined among European adolescents, with girls being consistently less active than boys (Bergier, Niźnikowska, Bergier, et al, 2017). It has been estimated that only 34% of 13–15 year olds are active enough to meet the current WHO recommendation for children and adolescents (WHO, 2010; see Table 1), although a cross-sectional study using the International Children's Accelerometry Database focusing on data from nearly 30,000 European 4–18 year olds found that while PA levels were high at the lowest intensities, only 3-5% of children and young people reached the highest threshold (corresponding to walking at approximately 4–5 km/h) (Guinhouya, Samouda & De Beaufort, 2013). Such inactivity contributes to the rising rates of overweight and obesity, especially in young people from low socioeconomic backgrounds (Loring & Robertson, 2014). In some European countries, more than 40% of children are overweight and approximately 25% are obese (Wijnhoven, van Raaij, Spinelli, et al, 2014), contributing to the proliferation of noncommunicable diseases in the region (Nittari, Scuri, Petrelli, et al, 2019).

Only 34% of 13–15-year old are active enough to meet the current WHO recommendation for children and adolescents.

Age group	PA recommendations	Criteria typically used to define meeting PA recommendations
School-aged children and adolescents aged 5–17	1. Accumulate at least 60 min of MVPA daily 2. Amounts of PA greater than 60 min provide additional health benefits 3. Most of the daily PA should be aerobic. VPA should be incorporated, including those that strengthen muscle and bone, at least 3 times per week	≥60 min of MVPA to VPA on all 7 days of the week

Table 1: Recommendations on PA for children and adolescents (based on WHO, 2010)

To address the problem of physical inactivity in childhood and youth, most of the governments of the EU countries have started to act in the last few years, by adopting policies that promote Health-

Enhancing Physical Activity (HEPA) (Breda, Jakovljevic, Rathmes, et al, 2018). However, as low levels of activity show no sign of declining in the region, there is an acknowledged need for governments to do more (Gelius, Tcymbal, Abu-Omar, et al, 2020; Rütten, Abu-Omar, Messing, et al, 2018). EU Member States acknowledged the benefits of action at the EU level, leading to the adoption of the Council of the EU Recommendation on promoting HEPA across sectors, including schools (Council of Europe, 2013). The Council's concluded: "school has the potential to be an effective tool to increase awareness of the importance of HEPA, and schools can be easily and effectively targeted to implement activities in this regard" (Article 7).

Relatively low levels of PA and high levels of sedentary behaviours during childhood and youth are cause for concern. The first two decades of life are, perhaps, the most crucial from the perspective of public health, since health and developmental changes during this period – either positive or negative – affect well-being and life opportunities not just during childhood and youth, but for later life (Bailey, Agans, Côté, et al, in press). This presents a strong justification for encouraging the development of healthy behaviours and habits among children and young people.

The first two decades of life are, perhaps, the most crucial from the perspective of public health, since health and developmental changes during this period affect well-being and life opportunities not just during childhood and youth, but for later life.

2.3. Tracking Physical Activity

An important part of this rationale is the potential for health-enhancing experiences to become habitual, thus are likely to 'track' over time. Tracking is defined as "a tendency of individuals to maintain their rank or position in a group over time" (Telama, 2009, p. 1). The evidence to support the tracking of activity from youth into adulthood is limited, due to the inherent practical and methodological difficulties of undertaking such research, rather than the lack of any tracking effect (Telama, Yang, Leskinen, et al, 2014). Studies testing the statistical relationship between PA in childhood or adolescence and activity during adulthood generally show a low-to-moderate level of association, meaning that active children do not necessarily become active adolescents or active adults (Telama, 2009; Van Der Zee, Van Der Mee, Bartels, et al, 2019). Two variables have been found to be particularly significant with regarding to the tracking of PA: time and sex. Maintenance of level of PA decreases over time (Parsons, Power & Manor, 2006), and tracking from childhood to adolescence or from adolescence to adulthood is lower than the tracking across the longer phase of adulthood itself (Van Der Zee, Van Der Mee, Bartels, et al, 2019). And tracking is influenced by sex, with lower coefficients found in girls & women than in boys & men (Telama, Yang, Leskinen, et al, 2014). However, studies show slightly stronger tracking effects for physical inactivity from childhood and adolescence into adulthood,

suggesting that sedentary young people have an increased risk of becoming sedentary adults (Biddle, Pearson, Ross, et al, 2010; Mišigoj-Duraković, Devrnja, et al, 2018).

Some studies have shown that a physically active lifestyle during childhood and adolescence is associated with lower body fat and increased fitness in young adulthood (Kemper & Monyeki, 2019). There is also some evidence that physically active young people are less likely to become regular smokers (Salin, Kankaanpää, Hirvensalo, et al, 2019), and more likely to consume fruit and vegetables later in life (Lounassalo, Hirvensalo, Kankaanpää, et al, 2019). However, these associations seem to be heavily affected by the settings in which early experiences of PA take place (García-Fernández, González-López, Vilches-Arenas, et al, 2019).

3. Schools as Settings for Health-Enhancing Physical Activity

3.1. Why Schools?

The findings discussed so far highlight the need for early promotion of health-enhancing PA for the enhancement of well-being, both during childhood and youth, and in later life. Schools have frequently been suggested as valuable settings for interventions to address this situation, and public health entities throughout the world have advocated an increase of PA opportunities for children and young people through comprehensive or whole-school approaches (Böcker, 2014; Pavelka, Sigmund & Sigmundová, 2014; Volkmann, 2015). In this approach, PA is no longer isolated to PE classes or recess, nor is it the sole responsibility of PE teachers (Dinkel, Schaffer, Snyder, et al, 2017). There are several characteristics of schools that make them well-suited as settings for the promotion of health-enhancing PA:

Public health entities throughout the world have advocated an increase of physical activity opportunities for children and young people through comprehensive or whole-school approaches.

- 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 (Bailey, Agans, Côté, et al, in press);
- This contact happens during a crucial period of development, during which many health-related behaviours and interests are formed which can be carried forward into later life (Karnik & Kanekar, 2011);
- Schools present a unique setting for integrating PA with other health-related messages (Böcker, 2010);
- Schools can create easily accessible physical environments in which children regularly engage in PA (Ip, Ho, Louie, et al, 2017);

- Schools, especially primary schools, often act as a hub of community activities, creating a focal point for PA opportunities, both directly (by organising school-based PA and PE), and indirectly (by encouraging PA at home, in the neighbourhood, and during commuting to and from school (Guinhouya, 2010);
- School lessons and other supervised periods are the only formal opportunities for the promotion of the knowledge, skills, attitudes and values that underpin regular PA (Cale, 2020).

School is the main societal setting for the promotion of regular HEPA, the development of physical skills and the provision of PA in children and young people (Bailey, 2018b). For many children and young people, school is the main environment for being physically active, whether through PE lessons, other PA opportunities, or after-school activities (Davies, Wood, Banfield, et al, 2014; Elflein & Huh, 2014). There is evidence that for a growing number of children, school provides the main opportunity for regular, structured sport and PA, as a combination of economic pressures and parental concerns for safety mean that fewer children are able to play games in non-school settings (Cope & Bailey, 2017; Shaw, Bicket, Elliot, et al, 2015).

For many children and young people, school is the main environment for being physically active, whether through physical education lessons, other physical activity opportunities, or after-school activities.

3.2. Healthy and Active Schools

There have been numerous models promoting healthy schools as hubs of health promotion, in general, and healthy PA, in particular (Daly-Smith, Quarmby, Archbold, et al, 2020; Nicolescu, 2019; Webster & Nesbitt, 2017). Many of these models build on the groundwork laid down by the WHO's Health Promoting School framework (2020), and its aim of "a whole-school approach, and focuses on reorienting school systems toward health promotion through embedding health and well-being in the curriculum, creating healthy social and physical environments and engaging with parents and the wider community" (Bartelink, Van Assema, Jansen, et al, 2019, p. 2). The common theme of these developments is a claim that health promotion can and should be delivered through a school-wide approach, in which different elements are integrated into a synergistic whole.

Two models presented below highlight the multiple opportunities for PA at or connected with school. The former highlights the temporal dimension of PA opportunities at school; the latter the interconnectedness of an effective Active School (see Figures 2 and 3).

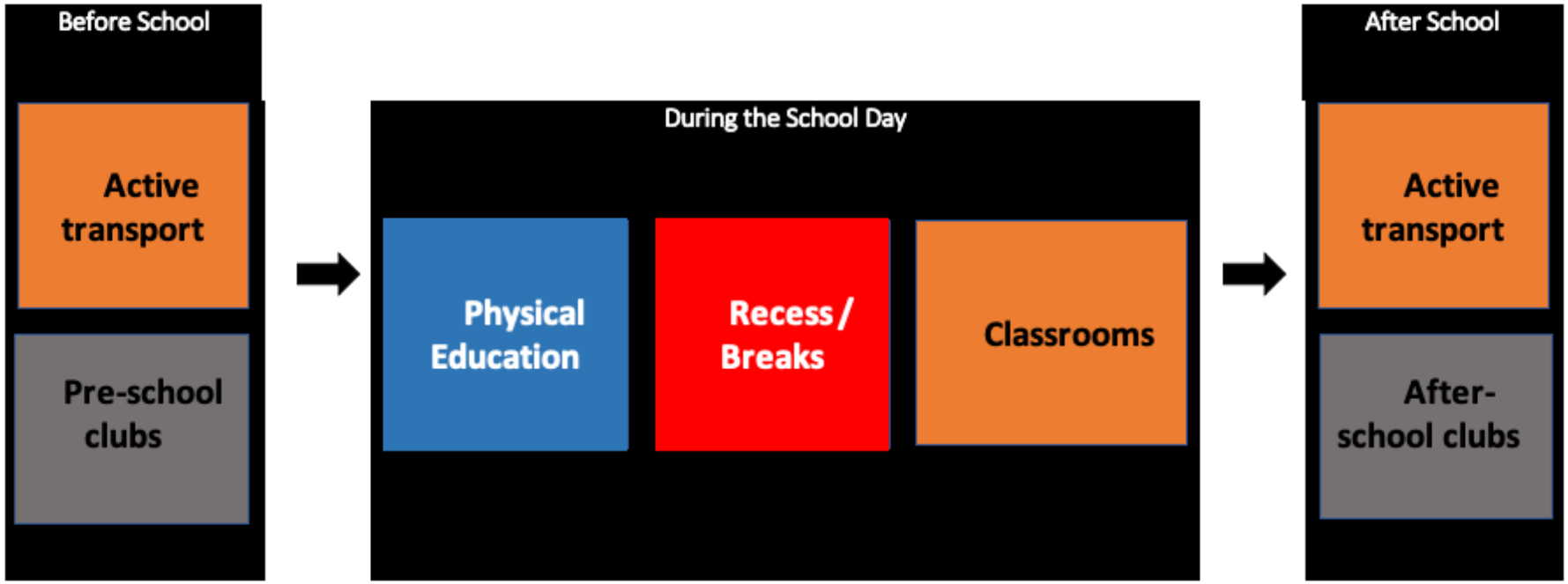


Figure 2: A model of PA opportunities at school (inspired by Beets, 2012)

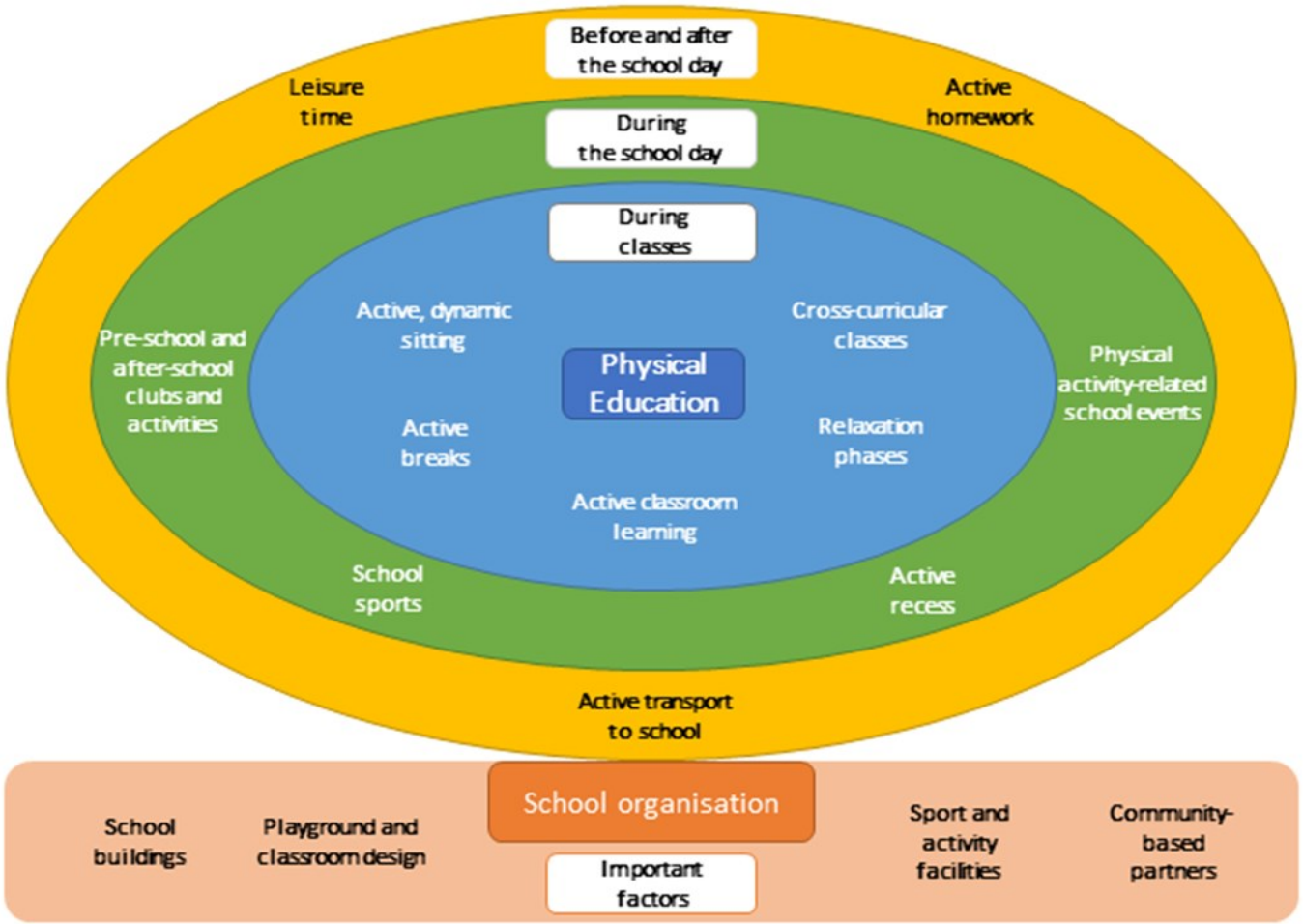


Figure 3: A model of PA opportunities at school (Scheuer & Bailey, 2021, p. 174)

Unfortunately, school-related PA is generally fragmented and varies greatly between regions, countries, and even within schools. PE has typically been relied upon to provide PA, as well as curricular instruction for students (Kohl & Cook, 2013). However, doubts have been raised about whether PE alone is capable of providing enough PA to fulfil guidelines (Scheuer, 2019), or, indeed, whether it should take this role at all (Tinning, 2011). Even curricula that prioritise PE's role in the promotion of PA also includes a host of educational outcomes related to psychological, intellectual, and development, and at least some of this curriculum content is likely to be well-suited to students seeking to maintain a MVPA. An additional problem with equating PE and PA is that, even if teachers managed to create lessons in which all students were active for all of the lessons, the total PA accrued would not come close to reaching the hour-a-day target because daily PE is extremely rare. Most educational systems allocate between 90 and 120 minutes a week at primary and secondary levels, and, as will be discussed later in this report, research shows, less than half of PE lessons typically see students reaching MVPA. More importantly, perhaps, there is an important difference between promoting students' PA and laying the foundation for lifelong PA. By most accounts, lifelong PA is likely to occur when an individual acquires and practices a broad range of knowledge, skills, attitudes, and values (Kohl & Murray, 2012), so s/he is motivated to make informed decisions about the multitude of PA opportunities available at each stage of the lifecourse. Probably the most important of these competences from the perspective of lifelong PA is the development of mature motor skills (Stodden, Goodway, et al, 2018). This issue is discussed further a little later, but for now it is enough to the development of movement skills seem to be a necessary condition of sustained PA, since such skills supply the basic competences to engage in meaningful PA in the first place. Basic movement skills are also precursors to more specialized and specialist skills that are prerequisite for participation in the culture of human movement that connects with many aspects of daily life (Herrmann, Bund, Gerlach, et al, 2015). This is especially the case as students progress from spontaneous PA play to activities dependents on rules, roles, and specialised skills (Donnelly, Mueller & Gallahue, 2016). Merely making students more active is a relatively simple matter. Schools could, for example, begin each day with synchronised callisthenics, as some Asian schools do, or replace traditional desks with standing desks (Daly-Smith, Quarmby, Archbold et al, 2020), fit each desk with an exercise cycle, so students cycle during classroom lessons (Fedewa, Abel & Erwin, 2017). Alternatively, perhaps schools could initiate a 'Daily Mile', which was first introduced in Scotland, and is spreading across Europe. The basic idea is that each day, during class time, pupils run or walk outside for 15 min (~1 mile) at a self-selected pace (Chesham, Booth, Sweeney, et al, 2018). Each of these strategies is likely to increase students' daily PA levels, and perhaps they deserve consideration for that reason alone. However, the extent to which they will act as a motivate PA outside of school time, and act as the bases for sustained PA in later life is unclear. It may be the case that substantially increasing

levels of activity through compulsory activities that do not cognitively engage individuals' (as would happen during skill learning and problem-solving tasks) risks some sort of compensation whereby voluntary PA during free time becomes reduced (Ridgers, Barnett, Lubans, et al, 2018). An old proverb seems apposite here: "give someone a fish, and they are fed for one day; teach that person to fish, and they are fed for the rest of their life!"

The concept of the Active School, therefore, is a radical departure from traditional approaches to PA promotion. It seeks to reconcile the evident potential of the school as a unique setting for the promotion of PA, with the barriers presented by conventional approaches. This is the stance taken by the US Institute of Medicine:

> "Clearly schools are being underutilized in the ways in which they provide opportunities for physical activity for children and adolescents. A whole-of-school approach that makes the school a resource to enable each child to attain the recommended 60 minutes or more per day of vigorous or moderate-intensity physical activity can change this situation." (Kohl & Cook, 2012, p. S-6)

Under such an approach, all of a school's components and resources operate in a coordinated and dynamic manner to provide access, encouragement, and programmes that enable all students to engage in VPA or MVPA 60 minutes or more each day. A whole-of-school approach encompasses all segments of the school day, including travel to and from school, school-sponsored before- and after-school activities, recess and lunchtime breaks, PE, and classroom instructional time. Beyond the resources devoted to quality PE for all students, other school resources, such as classroom teachers, administrators, and aspects of the physical environment, are oriented toward PA. Extra-curricular sport and other PA are made available to all who wish to participate, active transport is used by substantial numbers of children to move from home to school and back again, recess and other types of breaks offer additional opportunities for PA, and lesson plans integrate PA as an experiential approach to teaching. Importantly, they are framed within contextual or socio-ecological perspectives that acknowledge the need for the engagement of all school stakeholders (such as students, teachers, parents and wider community) (Samdal & Rowling, 2011; Storey, et al, 2016). The support of parents seems to be particularly important (Rivard, Deslandes & Collet, 2010).

In an Active School, all of a school's components and resources operate in a coordinated and dynamic manner to provide access, encouragement, and programmes that enable all students to engage in 60 minutes or more of physical activity each day.

A whole-of-school approach encompasses all people involved in the day-to-day functioning of the school,

including students, teachers, and parents. It creates an atmosphere in which PA is appreciated and encouraged by all these groups. School buildings, outdoor grounds and playgrounds, indoor and outdoor equipment, and streets and pathways leading to the school from the surrounding neighbourhood encourage and enable all persons to be more physically active. Moreover, the school is part of a larger system that encompasses community partnerships outside the school to help these goals be realised.

3.3. The Virtuous Cycle

Childhood (especially up to puberty) represents a particularly important period in the development of these skills, since they represent the fundamental resources upon which engagement with all later PA relies (Lubans, Morgan, Cliff, et al, 2010). This is a time when the learning of certain basic movement skills is relatively easy, and during which development is accelerated. Some go further, arguing that the period of childhood is so critical for movement skill learning that if children do not develop a broad foundation of skills during this period, they will never acquire fluency and confidence in movement (Balyi, 2001). The evidence base for claims of a critical period like this is weak (Bailey, Collins, Ford, et al, 2010). However, it does seem to be the case that failure to master movement skills at one stage of development will hinder the development of skills at the next, because each stage of skill development is built upon the preceding phase, and this will restrict participation in sport and other forms of PA (Goodway, Ozmun & Gallahue, 2019).

Childhood represents a particularly important period in the development of movement skills, since they represent the fundamental resources upon which engagement with all later physical activity relies.

A related factor is physical self-perception, or the individual's perceptions, evaluations and descriptions of their physical self (Christiansen, Lund-Cramer, Brondeel, et al, 2018). In particular, movement skills have been found to relate to perceived competence in PAs (Hulteen, Morgan, Barnett, et al, 2018). Studies have also found an association between perceived competence and PA behaviour (Gu, Thomas & Chen, 2017) and with actual competence or motor skill proficiency (Khodaverdi, Bahram, Stodden, et al, 2016). These findings are extremely important, since skill proficiency is a correlate of both PA participation and fitness in childhood and adolescence (Hulteen, Barnett, Morgan, et al, 2018). Low levels of competence and confidence may result in children avoiding PA settings, thereby removing themselves from the context that are most needed. One way of envisaging the evidence that relates to this situation is as a 'virtuous cycle', which is offered in Figure 4, below.

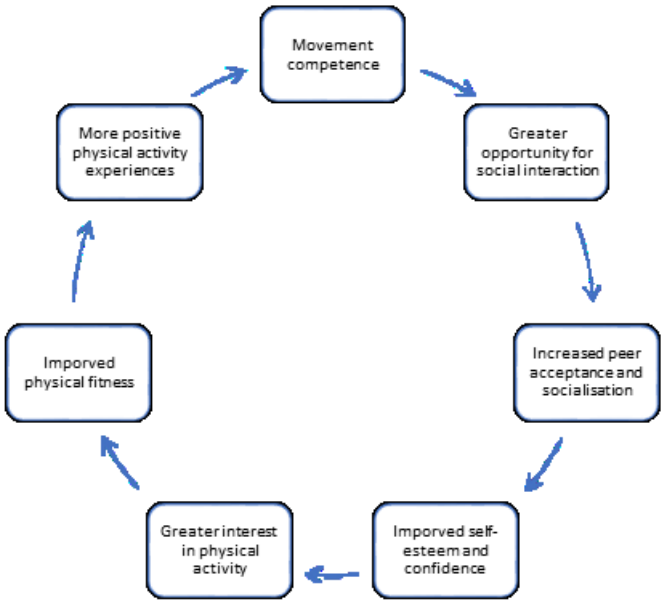


Figure 4: A 'Virtuous Cycle' of the Interaction between movement skill development and psycho-social development (adapted from Bailey, Doherty and Pickup, 2007)

Following the logic of this model, lack of movement competence can initiate the opposite set of outcomes – a 'vicious cycle', whereby a deficit of skills leads to an avoidance of movement opportunities and consequent social isolation.

Without opportunities to develop a foundation of movement skills, children and young people will be severely restricted in their capability to engagement in different forms of PA, both at that time and throughout the lifecourse (Bailey, Collins, Ford, et al, 2010). Movement skills track quite consistently during childhood (Hulteen, Morgan, Barnett, et al, 2018), so greater competence in youth may predict later PA. Children and young people with better motor competence may find it easier to be physically active and may be more likely to engage in PA compared with peers with poorer motor skill competence. Children with poor motor proficiency may subsequently choose a more sedentary lifestyle to avoid these challenges (Holfelder & Schott, 2014). Consequently, difficulties in developing a basic level of movement confidence can create a 'proficiency barrier' to participation as children will not have the necessary skills to be active or play sport (De Meester, Stodden, Goodway, et al, 2018). The development of these fundamental skills can have a long-lasting effect on physical fitness and participation, both during childhood and adulthood, because learning a broad base of movement skills in childhood opens up opportunities to take part in a large range of activities. An equally important

Without opportunities to develop a foundation of movement skills, children and young people will be severely restricted in their capability to engagement in different forms of physical activity, both at that time and throughout the lifecourse.

corollary of the proficiency barrier claim is that the absence of these skills means that individuals will fail to develop the necessary range of options to be active because he or she lacks the necessary physical competence (Stodden, True, Langendorfer, et al, 2013). This goes some way in explaining why participation in structured PA programmes during childhood may track to participation in adulthood, which in turn results in improved physical health for life. Children who are more proficient in movement skills are more likely to be more physically active and fit in adolescence (Lai, Costigan, Morgan, et al, 2014; Robinson, Stodden, Barnett, et al, 2015).

Numerous authors have argued that the key variable in determining the positivity and scale of the outcomes of participation in PAs is the social environment in which they take place (Bailey, Armour, Kirk, et al, 2009; Howie, Daniels & Guagliano, 2020; Whitelaw, Teuton, Swift, et al, 2010). Most of the potential benefits claimed for active lifestyles do not happen automatically, and there is plenty of evidence that activity alone is rarely enough. Indeed, negative PA experiences can lead to negative outcomes and harm (Bean, Fortier, et al, 2014;). As Svoboda (1994) stated in an early European report on sport, the presumed positive outcomes are “only a possibility", and a simple dose-response effect between participation and outcome cannot be assumed. This is with good reason as there is ample evidence to suggest that participation in PA can result in both negative and positive outcomes (Bean, Fortier, Post, et al, 2014). So, although participation in PA contexts can potentially promote positive, healthy development, “it is best not to take the relationship as a “given”; it can be difficult to achieve; and can only be realised in association with a series of conducive ‘change mechanisms’” (Whitelaw, Teuton, Swift, et al, 2010, p. 65). Unfortunately, evidence suggests that many European children and young people do not experience such conducive ‘change mechanisms’. Many do little or no PA at home or in their free time (Cope & Bailey, 2017; Shaw, Bicket, Elliot, et al, 2015), and presumably, even fewer experience activity in ways that facilitate positive and sustainable engagement.

Most of the potential benefits claimed for active lifestyles do not happen automatically, and there is plenty of evidence that activity alone is rarely enough. The key variable in determining the positivity and scale of the outcomes of participation in PAs is the social environment in which they take place.

3.4. Inactive Schools

So, schools, as the only setting with trained staff, suitable facilities, and designated time, are uniquely placed to introduce and encourage health-enhancing PA. There is substantial evidence that a high-quality school-based PA experience can have a significant impact on current and future activity levels (Kohl & Cook, 2013; McKenzie, Sallis, Rosengard, et al, 2016; Slingerland & Borghouts, 2011). Unfortunately, the time spent in PA during the school day has nonetheless been gradually diminishing

in many countries (Kohl & Cook, 2013; UNESCO, 2015). A crowded curriculum is often attributed to the tendency of PA to be regarded as a marginal issue in schools, including a long-standing valuing of the mental over the physical, and the associated prioritising of mathematics and the natural sciences over physical and vocational aspects of schooling (Bleazby, 2015; Escriva-Boulley, Tessier & Sarrazin, 2018). The erosion of PE within schools is a widely debated issue, as PE classes are increasingly replaced with academic content to improve student scores on standardised tests (UNESCO, 2015). Alongside these institutional changes, secular changes to PA have clearly bled into school life (Cope & Bailey, 2017).

An important aspect of the urgency of engaging schools in the HEPA agenda is the current situation in which large portion of waking hours filled with either sedentary or LPA (Kohl & Cook, 2013). Unfortunately, children and young people spend a considerable portion of their time at school being sedentary (Egan, Webster, Beets, et al, 2019), and this increases during and following the transition from primary to secondary school years (Pearson, Haycraft, Johnston, et al, 2017). In fact, school is among the most sedentary environments for children and young people. For example, Norwegian primary and secondary school students spend between 7.5 to 9 hours per day in sedentary behaviour (Skage & Dyrstad, 2019), and even the youngest students in US schools can spend 75% of their time sitting (Savina, Garrity, Kenny, et al, 2016). One review of accelerometry research found that 6–11-year olds spent about 6.1 hours-per-day sedentary, while 12–15 and 16–19-year olds) spent 7.5 and 8.0 hours-per-day, sedentary, respectively (Pate, Mitchell, Byun, et al, 2011). International research has shown that both primary and secondary students spend most of their schools sedentary, with girls, obese children, older children, and those who did not have PE more sedentary than their peers (da Costa, da Silva, George, et al, 2017; Yli-Piipari, Kulmala, Jaakkola, et al, 2016). Increases in sedentary behaviour over time in children and adolescents have been associated with increases in adiposity and BMI (Mann, Howe, Basterfield, et al, 2017).

Schools are among the most sedentary environments for children and young people.

Based on an averaging of available data (Cope & Bailey, 2017; Catellier, Schmitz, et al, 2012), with about 15 hours per day of wakefulness, sedentary and LPA fill 80% of children's and young people's time. For the minority of students who do meet the 60-minute daily recommendation for MVPA and VPA, sedentariness and LPA would fill 93% of the day (Matthews, George, Moore, et al, 2012). Figures 5 and 6 summarise this predicament.

Sedentary and low levels of physical activity fill 80% of children's and young people's waking time.

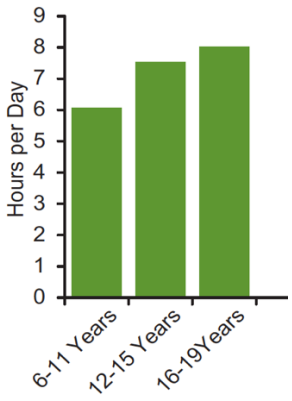


Figure 5: Hours per day spent in sedentary activity by age group, ages 6-19 (data from Matthews, 2012)

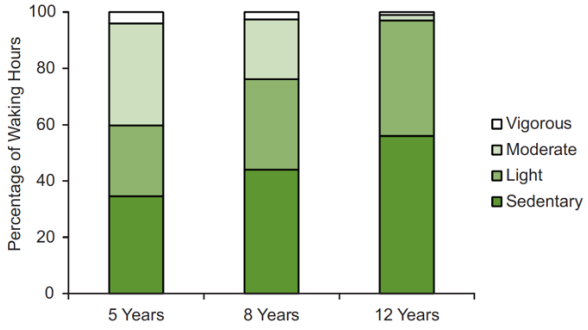


Figure 6: Percentage of waking hours spent in sedentary, LPA, MVA, and VPA by girls aged 5, 8 and 12 (data from Kohl & Cook, 2013)

So, for the majority of children and young people not meeting the current recommendation for VPA or MVPA, nearly the whole day is taken up with sedentariness and relative inactivity (Treuth, Catellier, Schmitz, et al, 2012).

This is cause for concern as sedentary behaviour is associated with serious non-communicable diseases, such as cardiovascular disease, cancers, and type-2 diabetes (González, Fuentes & Márquez, 2017). As one medical researcher put it, "Sitting is the new smoking" (MacVean, 2014), so large periods of sedentariness in schools is cause for concern, exasperated by the finding that young people spent most of their time after school doing sedentary activities, such as homework, watching TV, and socialising (Arundell, Fletcher, Salmon, et al, 2016).

So, while school is the main societal setting for the promotion of PA, and associated elements like the development of movement skills and positive health behaviours, the opportunity it offers is not being fully realised. School-based interventions have been found to have significant effects on young people's PA and sedentary behaviours, although the effects have varied considerably (Biddle, O'Connell & Braithwaite, 2011; Demetriou & Höner, 2012; Metcalf, Henley & Wilkin, 2012). In addition, effects have been generally recorded in school-based PA, while effects outside of school (in leisure time and commuting) have often been overlooked (Hynynen, Van Stralen, Sniehotta, et al, 2016), and many reviews (especially pre-2010) have tended to either include a very broad age range (e.g., 6–18-year-olds) or focus on younger children (Safron, Cislak, Gaspar & Luszczynska, 2011; van Sluijs et al., 2007), which is a weakness in the empirical base in light of evidence

School-based interventions have been found to have significant effects on young people's physical activity and sedentary behaviours, although the effects have varied considerably.

that age moderates the effectiveness of school-based interventions (Hynynen, Van Stralen, Sniehotta, et al, 2016; Yuksel, Şahin, Maksimovic; et al., 2020). Another weakness in the literature is the tendency to treat physical activities as both homogeneous and necessarily tied to outcomes.

A range of factors influence teachers' engagement with health-related issues, such as professional preparation, competing pressures from other stakeholders, curriculum and assessment requirements at the policy levels, and personal knowledge, skills, attitudes, and values.

There is a huge list of potential types of PAs, each with its strengths and weaknesses as vehicle for the promotion of PA in schools (Hall, McDonald, Hay, et al, 2016; Leek, Carlson, Cain, et al, 2011). While fitness-based activities, such as running and weight-training, provide among the highest PA intensities (Lazzer, Boirie, Bitar, et al, 2003), these activities are often not preferred by students whom more often prefer to play traditional team games (Bailey, Cope, Pearce, 2013: Visek, Achrati, Mannix, et al, 2015). However, team sports have been criticised as highly competitive, exclusionary, and leading to disparate levels of participation between students, due to the dominance by more experienced or skilful players -Carrillo, Devis-Devis, Peiro-Velert, et al, 2012). Overly competitive sports environments can lead to reduced enjoyment in PA, which may be factors underpinning gender-based differences in MVPA (Beets, Shah, Weaver, et al, 2015; Meyer, Roth, Zahner, et al, 2013; Schuna, Lauersdorf, Behrens, et al, 2013). Speaking generally, girls tend to prefer non-traditional activities such as dance, aerobics, yoga and walking (Owen, Curry, Kerner, et al, 2017). So, treating PAs as a homogeneous group is a serious conceptual error if the intention is to understand the bases of Active Schools.

There is a huge list of potential types of physical activities, each with its strengths and weaknesses as vehicle for the promotion of PA in schools.

3.5. Promoting Physical Activity

It also needs to be acknowledged that the relation between PA and intended outcomes is non-linear: positive outcomes do not necessarily follow potentially worthwhile PA opportunities. Almost all of the benefits attributed to participation in PAs are mediated by a host of factors, of which the extent to which the activities on offer, and atmosphere in which they are presented, are particularly significant (Agans, Säfvenbom, Davis, et al, 2013). The quality of the PA experience is at least as important a predictor of positive outcomes as the quantity of activity. Within the context of schools, it seems clear that teachers and other school staff are key mediators of the effectiveness of school-based PA strategies (Bailey, Armour, Kirk, et al, 2009; Whitelaw, Teuton, Swift, et al, 2010). A range of factors influence teachers' engagement with health-related issues, such as professional preparation, competing pressures from other stakeholders (parents, administrators, colleagues, and students), curriculum and assessment requirements at the policy levels, and personal knowledge, skills, attitudes, and values (Cothran, Kulinna & Garn, 2010). Most European primary school

teachers have limited professional education in PA promotion, and lack confidence in their capability in this area (Baker, Leasu, Nutt, et al, 2017; Dyrstad, Kvalø, Alstveit, et al, 2013). These teachers, however, appear to value PA in their students' lives, and believe its promotion has a place in schools (Cothran, Kulinna & Garn, 2010; Dinkel, Schaffer, Snyder, et al, 2017; Stylianou, Kulinna & Naiman, 2016). Secondary teachers seem to face different pressures in their promotion of PA. PE teachers have reported a negative influence of a strongly competitive ethos (Knowles, Niven & Fawkner, 2011; Slater & Tiggemann, 2010). This can reduce participation, especially for girls and/or students of lower sporting ability (Martins, Marques, Sarmento, et al, 2015), and introduce an uncertainty of priorities (Boyle, Jones & Walters, 2008). Findings consistently support the importance of teachers providing encouragement and support for PA (Abdelghaffar & Siham, 2019; Eather, Morgan & Lubans, 2013).This is important as teachers are influential role models for children and young people's PA, with students less likely to implement active living messages regarding, for example, walking or cycling to and from school if they know the teachers who encourage them to do activities do so themselves (Cardinal, 2001; Smuka, 2012).

Another consideration in the conceptualization of the Active School is the low status of PA in many countries, demonstrated through poor funding and resources, and a lack of volunteering by other staff to support non-timetabled opportunities (Bailey, 2018b; Kohl & Cook, 2013). Qualitative studies with secondary school students report a change of school culture away from PA in recess and lunch times on leaving primary schools, where a culture of 'play' was more commonly supported (Knowles, Niven & Fawkner, 2011; Morton, Atkin, Corder, et al, 2016).

While many agencies have called on schools to create settings in which children and young people have many opportunities to engage in and learn about healthy, physically active lifestyles, implementing this culture in practice has often proved a challenge for various reasons (Centeio, Barcelona, Kaszeta, et al, 2018). Part of the challenge facing those who wish to promote PA in schools is that schools are dynamic, complex systems where the focus is on learning. Consequently, they are likely to be resistant to changes that are perceived at threatening academic achievement within a limited time and budget (van den Berg, Singh, Komen, et al, 2019). Many teachers, especially during in primary (or elementary) schools struggle with implementing PA in the regular curriculum (Christian, Todd, Davies, et al, 2015; McMullen, Kulinna & Cothran, 2014), with perceived low levels of confidence and competence in the area, as well as lack of time, being the most important reasons (Skage & Dyrstad, 2019; van den Berg, Salimi, De Groot, et al, 2017). Teachers are hesitant to replace time and resources

Many teachers, especially during in primary schools struggle with implementing physical activities in the regular curriculum, with low levels of confidence and competence in the area, as well as lack of time.

from regular lessons with PA. So, a key challenge for any school-based programme is to manage the 'tug-of-war' between competing priorities (Bartholomew & Jowers, 2011), achieving high levels of adherence to PA behaviours without compromising teachers' duties regarding the wider curriculum (van den Berg, Salimi, De Groot, et al, 2017).

Systematic reviews report that whole-school, multi-component interventions are most effective in school settings, especially when key stakeholders are empowered to commit and make the interventions sustainable (Langford, Bonell, Jones, et al, 2015). This reiterates findings from other studies demonstrating the importance of the inclusion of specific activities and practices in schools that can act as focal points for leveraging the promotion of healthy lifestyles in schools (Storey, Montemurro, Flynn, et al, 2016).

4. Reviews

The follow sections present a series of reviews of the scientific literature in support of the objective of this report:

> "To review evidence from the last ten years of the contributions of school-based physical activity, physical education, and school sport to the promotion of health-enhancing physical activity".

Evidence for these reviews was gathering using a methodology called 'rapid reviewing', which is "a streamlined approach to synthesizing evidence in a timely manner" (Khangura, Konnyu, Cushman, et al, 2012, p. 1). It follows many of the strategies used by more established approaches, adapted for a faster and more variegated response. Systematic reviewing, generally accepted as the 'gold standard' of methods of summarising and analysing research findings (Munn, Stern, Aromataris, et al, 2018), requires a considerable amount of time and investment in human resourcing, and narrowly focuses on a specific question, whereas rapid reviewing allows quicker results and a more diverse coverage of subject-matter. For these reasons, the faster, more flexible approach is often used by policymakers, decision makers, stakeholders and other knowledge users. By adopting a rapid reviewing methodology, the hope was to realise some of the virtues of systematic reviewing, without becoming overcome by its inherent restrictions.

Searches were undertaken using a range of specialist academic databases (PsycARTICLES, PsycINFO, SPORTdiscus, CINAHL Complete), Google Scholar, as well as the academic social networking sites, ResearchGate, and Academia.edu. Recommendations were also made by members of the HEAPS project team. The following criteria were used to keep searches focused:

- Published from 1 January 2010 to 30 May 2020;

- Study conducted in either primary or secondary schools;
- Study investigated PA outcomes either as the sole or substantial focus;
- Empirical study, systematic review, or conceptual discussion.

Initial searches were carried out in English, followed by searches in German, French, Spanish and Czech. The search used a set of broad MeSH terms (Medical Subject Headings1) 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. The reviews were limited by focusing on school-setting and school-aged children and young people. As already mentioned, three contexts and seven activity-settings in schools are discussed in the following text, based on those identified by the HEPAS project partners:

Physical activity settings at school

- Active Breaks
- Active Homework
- Active Learning
- Active Recess
- Active Transport

Physical Education as a Setting

- Curriculum PE Lessons
- Teacher Education & Workforce

Sport as a setting

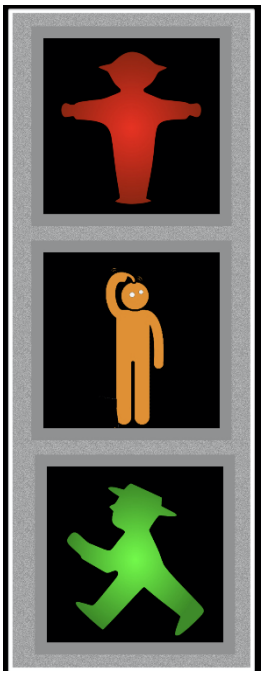
- School Sport

The general approach followed an earlier set of PA reviews by Public Health England (Chalkley, Milton & Foster, 2015). As such, it involved a purposive search, integration and translation of relevant literature related to contexts for Active Schools. Both reviews of literature and empirical studies are included in this analysis. Each section begins with a summary of the available reviews of literature in that area, followed by a narrative discussion of the empirical studies.

Once the different reviews had been completed, members of the HEPAS project team independently evaluated the weight of evidence related to the findings of each activity setting. Discrepancies were

[1] https://www.nlm.nih.gov/mesh/meshhome.html

discussed, and a consensus was agreed for each area. A simple traffic light coding system was used to indicate the weight of evidence[2]:



WEAK: Outcomes coded red, were those where there was not enough evidence to make any statements regarding potential associations with school-based PA

MODERATE: Amber outcomes did not have a strong evidence base; either because the evidence came from a small number of studies, the studies were of poor quality, or the evidence was equivocal (i.e., studies showed mixed/contradictory results)

STRONG: Green outcomes reflected a body of research with strong or at least sufficient evidence for a positive association with school-based PA.

Figure 7: Symbols for weight of evidence

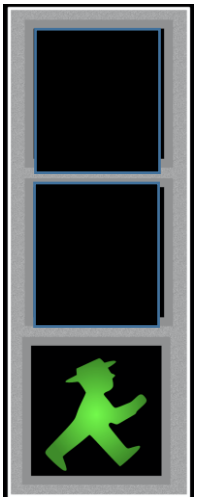
[2] The Red and Green figures are borrowed from the iconic East Berlin 'Ampelmännchen' (little traffic light men). The Amber figure was created for this report (there is no third image). They were chosen just because they seem more interesting than standard circular traffic lights.

Physical Activity Settings at School

5. Active Breaks

SUMMARY

- Active Breaks are relatively brief bouts of PA, usually led by a teacher during classroom lessons.
- Evidence shows Active Breaks increase students' PA levels, as well as contributing to healthier weight status, improved behaviour, enhanced cognition and greater enjoyment.
- The number and quality of studies in this area suggest that the evidence in favour of Active Breaks is STRONG.



5.1. Background

Active Breaks are characterised as short duration (typically 5–15 minutes) sessions of PA, usually led by the teacher or other members of school staff, during classroom-based lessons. They have been used by schools for 2 main reasons:

1. There is a public health objective of increasing children's levels of PA by including exercise within classroom lessons (e.g., Drummy, Murtagh, McKee, et al, 2016; Murtagh, Mulvihill, & Markey, 2013). Adding PA to the school day can be difficult due to competing curriculum priorities, budgetary concerns and lack of time reported by teachers and administrators (Kober, & Rentner, 2011). Active Breaks might provide a low-cost and feasible way to increase PA in all students.
2. Wider educational objectives call for PA as a way of improving learning or achievement in school subjects, such as mathematics, which might benefit from more active approaches to classroom lessons.

Active Breaks are characterized by short bout of physical activity performed as a break from academic instruction to increase or decrease students' activation.

These two themes are connected, to some extent, as proponents claim that "academic classroom time can be beneficially relieved with brief breaks for stretching or other activity associated with physical well-being" (Basch, 2011, p. 630). In other words, a side-effect of introducing PA into classrooms for health purposes is a useful respite from the pressures of traditional, sedentary study. This is consistent with the current understanding of cognitive functioning, which is enhanced by bursts of PA (Singh, Saliasi, Uijtdewilligen, et al, 2019).

Active Breaks can take various forms, and many curricula have been developed, tested, and disseminated (e.g., Bailey & DiPerna, 2015; Kibbe, Hackett, Hurley, et al, 2011; Whitt-Glover, Ham & Yancey, 2011). However, this setting has also witnessed numerous pseudoscientific, commercial products, such as the popular Brain Gym®, presumably seeking to capitalise on the current markets for so-called brain-based learning among policy makers and practitioners (Bailey, 2017a). 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. The duration, intensity, and structure of these activities can vary considerably (Turner, Calvert & Carlson, 2019).

Beneficial effects of PA goals introduced through Active Breaks seem to be achieved without undermining academic goals. Perhaps the most promising aspect of cognitive functioning to be positively affected by physical exercise and short bouts of PA in children seems to be the domain of executive functions (Tomporowski, Lambourne, & Okumura, 2011). So, classroom Active Breaks offer a context for increasing PA and enhancing academic performance.

Beneficial effects of physical activity goals introduced through Active Breaks seem to be achieved without undermining academic goals.

Active Breaks are unusual within the PA opportunities discussed in this report as their implementation depends largely on decisions made by classroom teachers. Many classroom teachers do not have experience with implementing Active Breaks, and the limited evidence available indicates they are not widely used in primary school classrooms, and barely at all in secondary schools (Turner & Chaloupka, 2017; Turner, Calvert & Carlson, 2019).

5.2. Findings

A number of reviews have summarised and quantified the contribution of Active Breaks to children and young people's PA. Five systematic reviews or meta-analyses were found for this report, and their findings are summarised in the able below:

Source	Country of authors	Type of review	Age phase	Sample	Key findings
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	3 studies assessed PA. Interventions replaced sedentary time with either LPA or MVPA depending on the design characteristics (mode, duration and intensity).

				breaks with 4-17 year olds. Searches of 8 scientific databases (to July 2017)	Only one study factored individual PA outcomes into analyses. Classroom movement break increased PA
Erwin, Fedewa, Beighle, et al (2012)	US	Systematic review		Searches of 5 scientific database, plus cascading using references in included studies. The range was Jan 1990 - February 2010.	6 studies measured the effects of Active Breaks on PA. It was found that these breaks were infrequent, often presented and analysed simultaneously with other PA interventions (e.g., recess, after school), or are not published in peer-reviewed journals. Active Breaks increase the amount of PA accrued in each school day. Students in primary school are affected more significantly by these interventions. The length of the PA intervention does not significantly influence the effect of the intervention.
Masini, Marini, Gori, et al (2020)	Italy	Systematic review		Searches of 6 databases and grey literature, with no time restriction and up to April 2019.	22 intervention studies were found. Active Breaks interventions had a significant effect in increasing PA levels in primary school children, both in terms of increased MVPA and step count.

Norris, van Steen, Direito, et al (2019)	UK, Netherlands, Singapore, Australia	Meta-analysis		There were 6 searches of 6 databases and grey literature, with no time restriction and up to April 2019, plus cascading using references in included studies.	42 studies (39 in preschool or elementary school settings) were identified. Active lessons were found to produce large, significant increases in lesson-time PA, and small, increases on overall PA.
Watson, Timperio, Brown, et al (2017)	Australia	Systematic review	5-12 years of age	Searches of 4 databases and grey literature up to January 2017 were carried out.	39 studies met the inclusion criteria, and 16 provided sufficient data and appropriate design for inclusion in the meta-analyses. Results of the meta-analyses showed no effect for PA.

Table 2: Systematic reviews - Active Breaks

Active Breaks have the potential to increase children's PA levels. However, all of the reviews listed above report that a relatively high number of studies reviewed were of low methodological quality, and with the exception of the Irish programme devised as part of Murtagh, Mulvihill & Markey (2013), most existing programmes have been conducted in the US (Calella, Mancusi, Pecoraro, et al, 2020; Kohl & Cook, 2013). So, findings from these reviews should be interpreted with a degree of caution. Only reviews by Daly-Smith, Zwolinsky,

Factors that mediate successful Active Breaks interventions, include time (competing requirements, teacher overload), resource availability, and supportive school climate.

McKenna, et al (2018) and Masini, Marini, Gori, et al (2020) included an explicit assessment of quality of the studies, and their findings deserve greater confidence. Nevertheless, the overall consistency of findings, combined with the relatively large number of studies, is also worth noting.

From the empirical literature, several PA interventions have identified factors that mediate successful Active Breaks interventions, such as time (competing requirements, teacher overload), resource availability, and supportive school climate might affect implementation (Innerd, Azevedo & Batterham, 2019; Naylor, Nettlefold, Race, et al, 2015). Schools are also under performance pressure to achieve academic objectives, which often results in a reduction of PE time and PA opportunities (Huberty, Dinkel, Coleman, et al, 2012). Therefore, a successful school-based PA scheme should be integrated into the curriculum and the school day.

Previously evaluated programmes that have integrated Active Breaks, such as 'Physical Activity Across the Curriculum' (PAAC; Szabo-Reed, Willis, Lee, et al, 2017), 'Energisers' (Mahar, 2019), 'Active Classrooms' (Martin & Murtagh, 2017), 'ACTI-BREAK' (Watson, Timperio, Brown, et al, 2019), and Take 10! (Goh, Hannon, Webster, et al, 2014) found that active break can promote PA, as well as increase time on task and improve academic performance. Evidence suggests that well-designed active break programmes can have a significant impact on children's PA. For example, one case study showed that the incorporation of structured Active Breaks increased MVPA for pre-schoolers, accounting for 60-90% of time spent in MVPA at school (Wadsworth, Robinson, Beckham, et al, 2012). Another study provided strong evidence that the Take 10! Programme was effective in increasing PA levels in children from 5 - 10 years old, in a variety of contexts, in different countries. The review of empirical research based on the scheme reported at least a 13% increase in PA levels, as well as the achievement of moderate energy expenditure levels and improved BMI (Kibbe, Hackett, Hurley, et al, 2011).

Active breaks can have a significant impact on children's PA, as well as increase time on task and improve academic performance.

As with PA, in general, girls tend to be less active during Active Breaks that boys (Bershwinger & Brusseau, 2013; Calella, Mancusi, Pecoraro, et al, 2020; Watson, Timperio, Brown, et al, 2018). Girls show less time spent in LPA and MVPA, and are more inactive than boys. However, possibly due to their lower baseline scores, girls respond better to the active break interventions (Calella, Mancusi, Pecoraro, et al, 2020). In addition, gender differences have been reported in terms of 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 (Vizcaíno, Sánchez-López, Notario-Pacheco, et al, 2014).

Girls tend to be less active during Active Breaks than boys.

It is clear from the published research that teachers are key figures in the implementation of successful programmes, by demonstrating, motivating, and monitoring PA sessions (Calella, Mancusi, Pecoraro, et al, 2020). Active Breaks can address both the lack of some teachers' knowledge and support the positive role activity plays in the learning environment. Empirical studies suggest that Active Breaks are generally popular with both students and teachers, and no evidence has been found that they necessarily interfered with the classroom learning or affected student behaviour detrimentally (Kibbe, Hackett, Hurley, et al, 2011; Wilson, Olds, Lushington, et al, 2015). Teachers tend to prefer Active Breaks of relatively low intensity, seeing VPA Active Breaks as disruptive of their teaching (e.g. as students removing jumpers and needing drinks) (Watson, Timperio, Brown, et al, 2018), which is unfortunate as VPA is more beneficial in terms of both physical health and academic effects (Singh, Saliasi, Uijtdewilligen, et al, 2019). Some evidence suggests that frequent (multiple times daily) short MVPA Active Breaks offer a feasible alternative to VPA breaks, leading to positive outcomes (Altenburg, Chinapaw & Singh, 2016; Altenburg, Chinapaw & Singh, 2016). The Active Breaks discussed in the studies of this review varied in duration from 4 minutes (Ma, Le Mare, & Gurd, 2015) to 20 minutes (Howie 2014). Activities tended to focus on aerobic activity (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 programmes, video exercise guides and/or creating and implementing their own strategies.

Teachers tend to prefer Active Breaks of relatively low intensity, more intensive physical activity, which can be disruptive of their teaching.

5.3. Examples of European Studies

Source	Country	Aim/Study	Findings
Calella, Mancusi, Pecoraro, et al (2020)	Italy	The purpose of this study was to develop and evaluate the feasibility of a classroom-based intervention which integrates PA during the school time, and assess its potential effect on reducing inactivity in primary school children. The intervention was performed with a sample of 47 children attending a primary school, structured in 2 sessions of classroom Active Breaks in 3 school days a week, shared with and supervised by the teachers.	The intervention showed an overall potential positive effect on the reduction of inactivity of 12 minutes and an equivalent increase in PA levels, of which 5 minutes were of MVPA. Girls showed lower time spent in LPA and MVPA and higher amount of inactivity than boys, and responded better to the intervention. The satisfaction of children and teachers was high.

Glapa, Grzesiak, Laudanska-Krzeminska, et al (2018)	Poland	The purpose of this study was to examine the effectiveness of 'Brain Breaks' in changing attitudes toward PA of school children. A sample of 326 pupils was randomly assigned to control and experimental groups within the study. During the classes, children in the experimental group performed PAs 2 times per day in 3 to 5 minutes using 'Brain Breaks' videos for 4 months, while the control group did not use the videos during the test period.	Although changes were minor, there were benefits of the intervention. 'Brain Breaks' contribute to better self-efficacy on learning while using video exercise.
Innerd, Azevedo, & Batterham (2019).	UK	Researchers aimed to explore the feasibility and potential effectiveness of a classroom-based intervention on MVPA and total PA. The sample was 152 children (10 ± 0.7 years). Teachers delivered an 8-week classroom-based intervention, comprising of 10 minutes daily MVPA integrated into the curriculum. Mean daily MVPA (min), total PA (mean cpm), physical fitness, and health-related quality of life measurements were taken at baseline, end of intervention, and 4-weeks post-intervention (follow-up)	There was a mild to moderate difference in mean daily MVPA between intervention and control groups at both 8 weeks and follow-up. The intervention was received positively with continuation reported by the teachers and children.
Martin & Murtagh (2017)	Ireland	The purpose of the study was to assess the effectiveness of the 'Active Classrooms' intervention, which integrates movement into academic lessons, on MVPA of primary school children during class-time and throughout the school day.	A significant difference for change in daily class time MVPA levels was identified between the treatment (n = 95) and control (n = 91) groups from pre- to post-intervention, and this difference was maintained at follow-up. No significant difference emerged between the treatment and

			control groups for change in school day MVPA levels. Teachers reported that they were highly satisfied with the programme.

Table 3: European Studies - Active Breaks

5.4. Conclusion

There is a growing body of research into the effects of Active Breaks at school. Most of this research has taken place in primary/elementary schools. Overall, evidence demonstrates that Active Breaks increase students' PA levels. Other reported benefits include healthier weight status, improved behaviour, enhanced cognition and greater enjoyment. As with other aspects of PA outcomes, successful implementation of Active Breaks seems to depend on a number of contextual factors, including:

- Availability of relevant resources;
- Teacher and senior management support;
- Positive teacher attitudes (Carlson, Engelberg, Cain, et al, 2017)

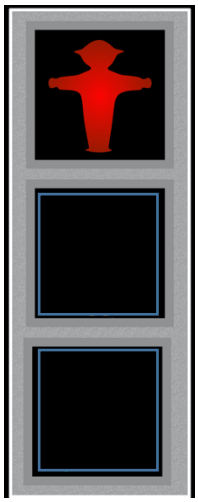
A word of caution should be sounded, too. Many of the published studies of Active Breaks are of relatively low quality, and there is a high variability in important design features, methods of intervention, duration and intensity, and outcome measures. So, further work in this area is needed. Nevertheless, from the perspective of the HEPAS project, Active Breaks seem a useful source of PA that enhances, rather than interferes with, wider educational outcomes. The case for Active Breaks is rated STRONG.

Overall, evidence demonstrates that Active Breaks increase students' physical activity levels. Other reported benefits include healthier weight status, improved behaviour, enhanced cognition and greater enjoyment.

6. Active Homework

SUMMARY

- Active Homework, in which students carry out PA-related practices after school, is a potentially useful way of increasing PA.
- The small number of identified studies report positive outcomes from Active Homework for both girls and boys, although effects tended to be relatively small across the school week.
- Due to the small number of studies and limited methodologies used, the evidence for Active Homework is rated as WEAK.



6.2. Background

The development of the Active Schools concept has been largely motivated by the perceived need to improve children and young people's PA levels (Daly-Smith, Quarmby, Archbold, et al, 2020; Wagner, 2016), capitalising on the distinctive characteristics of the school setting. Active Homework has been proposed as a possible way of promoting PA among students by extending the time available for schools to influence the health behaviours of students (Kääpä, Palomäki, Vähä-Ypyä, et al, 2017). Homework activities can be designed for students to apply and practice the skills learnt in PE lessons, and might take place at home (with or without parents' involvement), and in nearby sporting environments or facilities (Vogel, 2007). According to Kääpä, Palomäki, Vähä-Ypyä, et al (2017), students can find homework connected to PE lessons enjoyable and beneficial. For example, students reported positive responses to homework that included practicing with family member. In addition, it has been found that Finnish students enjoy participating in planning PE homework (Kääpä, Palomäki, Vähä-Ypyä, et al, 2017). One part of the rationale of Active Homework where it is promoted is to encourage students to become familiar with their local environments and available facilities to help make PA part of their lifestyles (Williams & Hannon, 2013).

Active Homework promote participation in physical activity at home by assigning homework that students can do on their own or with family members.

Active Homework has been proposed as a way of promoting physical activity by extending the time available for schools to influence the health behaviours of students.

So, the most common goal of Active Homework is to create additional opportunities for PA (Duncan, Stewart, McPhee, e al, 2019). This contrasts to the traditional purpose of homework, which has been to enhance a student's level of academic achievement (Cooper, 2015), and several countries include theoretical or conceptual content within PE curricula. Evidence regarding non-PA content in PE-related homework is limited, but it is known that some educational systems include expectations to promote knowledge about health-related PA and fitness, healthy lifestyles (in Australia, New Zealand, England, Wales, Scotland, Northern Ireland3, Ireland, and others) (Brown & Penney, 2017). Conceptual homework related to PA can be important, especially within PE, but it is not the focus of the review that follows. Its concern is the impact of Active Homework on children and young people's PA.

6.2. Findings

Research literature of the effects of Active Homework is limited. Indeed, there has been only one short review of the literature (Hill, 2018), and that included no relevant studies for this report. 3 empirical studies were identified that examined the relationship between Active Homework and PA. 2 papers were based in New Zealand, and investigated the same project (Duncan, McPhee, Schluter, et al, 2011; Duncan, Stewart, McPhee, et al, 2019); the third article reported a Finnish study focusing on adolescent girls (Kääpä, Palomäki, Vähä-Ypyä, et al, 2017).

Research literature of the effects of Active Homework is limited.

The New Zealand papers reported on the 'Healthy Homework' programme, which was a compulsory homework programme for increasing PA and healthy eating developed by health and education professionals. The primary aim of the intervention was to improve PA and dietary behaviours with participating children. Duncan, McPhee, Schluter, et al (2011) reported a pilot study, administered as a teaching resource to 100 9-to-11-year old students in 2 primary schools over a 6-week period. Healthy Homework resulted in a significant increase in PA for both girls and boys, suggesting that compulsory health-related homework can be an effective approach for increasing PA. It was, however, a small-scale investigation, using a simple intervention / control group method, so findings should be taken cautiously. A follow-up study (Duncan, Stewart, McPhee, e al, 2019) was more substantial, involving 675 children aged 7–10 years from 16 primary schools. Again, using an intervention / control group comparison, schools implemented an 8-week applied homework and in-class teaching module designed to increase PA and improve dietary patterns. PA was the primary outcome measure, and was

In one study, a compulsory homework programme resulted in substantial and consistent increases in children's physical activity, especially outside of school and on weekends.

[3] The 4 home countries of the UK have different educational systems.

assessed using 2 sealed pedometers that monitored school- and home-based activity separately. Significant intervention effects were observed for weekday PA at home and weekend PA, as well as BMI and fruit consumption. Additional analyses revealed that the greatest improvements in PA occurred in children from the most socio-economically deprived schools. Overall, the compulsory homework programme resulted in substantial and consistent increases in children's PA, especially outside of school and on weekends.

The Finnish study (Kääpä, Palomäki, Vähä-Ypyä, et al, 2017) examined girls' objectively measured PA in a lower secondary school as part of the 'Physical Education Homework Study'. The intervention involved 105 participants and lasted one week. It was found that active homework represented a small aspect of the students' whole-day PA, averaging 34 minutes per week (7th grade girls for 20 minutes, 8th grade girls for 51 minutes, and 9th grade girls 32 minutes). 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). The Physical Education Homework Study provided a variety of PA opportunities for the adolescent girls' after-school hours. However, these findings should be viewed with caution, as the sample was quite small, and there was neither controls nor pre-post measures of PA[4].

6.3. Examples of European Studies

Source	Country	Aim/Study	Findings
Kääpä, Palomäki, Vähä-Ypyä, et al (2019)	Finland	The purpose of this study was to examine girls' objectively measured PA in a lower secondary school as part of the PE Homework Study, a project. An additional aim was to provide insights into PE homework as part of PA. Different levels of PA were measured using accelerometers among girls aged between 12 and 15 years (n = 88) for a period of one week. In addition, self-reported structured diaries were	The PE homework was a small aspect of the participants' whole-day PA, averaging 34 minutes per week. 38% of the girls met the recommended levels of PA.

[4] It should also be noted that the publisher of this journal has been identified as a 'Potential, possible, or probable predatory scholarly open-access publisher', which is a claim associated with poor journal standards. This does not necessarily mean that articles published by such journals, but does raise concerns about quality and legitimacy of the editorial process (https://web.archive.org/web/20170103170850/https://scholarlyoa.com/publishers/)

		used to gather information about after school activities, including PE homework.	
Piech, Nowak, Birontiene, et al (2013)	Latvia and Lithuania	The aim of the study was to examine the extent to which a child can persuade the parents to a common PA and whether sport and recreation for children with homework are a successful proposal to increase motor activity of the family. Regularly once a week, on Friday, classes were conducted in 4 groups of about 10 children. Classes lasted 30 minutes. The classes covered girls and boys from groups of 5 and 6-year-old children. There was a total of 38 children. Physical activities carried out in the nursery school had its continuation in the form of frequent homework to do at home by the children and their parents[5].	Adults indicated (52.6%) that the common PAs caused a positive change in the behaviour of the family. Prior to the programme, only 39.5% of the respondents declared that they shared PA with the child. This number has increased after our classes. Research shows that 15% of parents purchased sports equipment after participation in the programme. Therefore, it can be argued that the PA programme for children with homework is a good way of promoting PA among families.

Table 4: European Studies - Active Homework

6.4. Conclusion

The evidence base related to Active Homework is currently weak. Only one of the studies reviewed here (Duncan, Stewart, McPhee, e al, 2019) is of high quality; the other 2 are really pilots. While the consensus from the 3 studies is that Active Homework can make a useful contribution to students' PA, the weight of evidence is too WEAK to draw any concrete conclusions.

The consensus from the studies is that Active Homework can make a useful contribution to students' physical activity, but the weight of evidence is weak.

[5] So this study did not address the question of homework's impact on students' PA.

7. Active Learning

SUMMARY

- Active Learning refers to the strategy of integrating PA into classroom lessons, across the school curriculum
- The findings reported here demonstrate that Active Learning is a cost-effective, enjoyable, motivating strategy to increase students' daily PA at school without undermining other educational goals. On the contrary, the available evidence suggests Active Learning often enhances other educational outcomes
- Assuming proactive leadership, teacher support, and teacher efficacy, the case for Active Learning is STRONG

7.1. Background

Research has shown that the benefits of PA in children are ubiquitous, including health, cognitive, and academic effects (Bailey, 2017a). Although the academic benefits of PA have been found to be evident even when time for PA replaces a part of the academic time (Burns, Brusseau, Pfledderer, et al, 2020; Singh, Saliasi, Uijtdewilligen, et al, 2019), there is a general concern in schools that time spent in PA is associated with a loss of academic time and school success (Cothran, Kulinna & Garn, 2010; Stylianou, Kulinna & Naiman, 2016). This review considers the potential contribution that PA can play when integrated in classroom lessons. This is sometimes called 'movement integration' (Webster, Zarrett, Cook, et al, 2017) or, in the HEPAS project, 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, whilst in others curriculum guidance makes the expectation of integration with other areas clear (Bailey, 2018b). In the United States of America, for example, recent years have seen an increasing tendency of Elementary Schools to integrate curriculum content into PE lessons (Kohl & Cook, 2013). These developments have been driven by 2 policy demands: to identify innovative pedagogical approaches in support of educational achievement; and to curb rising levels of inactivity and obesity.

Active Learning refers to the use of physical activity lessons in which curriculum topics are delivered through movement.

Many teachers find it difficult to win support for adding PA to the school day from colleagues and managers (Watson, Timperio, Brown, et al, 2019), and time constraints are often major barriers to implementing new PA (Naylor, Nettlefold, Race, et al, 2015), often due to curriculum demands in key learning areas and associated academic accountability pressure (McMullen, Kulinna & Cothran, 2014). So, time-efficient PA promotion strategies that contribute to PA promotion without undermining academic achievement are clearly needed. Active Learning has been proposed as a plausible solution to this challenge.

Theoretical support for the idea that PA can support classroom learning come from the field of embodied cognition, and its claim that that motor systems influence cognition, just as the mind influences bodily actions (Bailey, 2020). Thinking is grounded in action, it is argued, and linking movements with cognitive tasks can enhance learning. A second theoretical framework might also apply, here. Cognitive load theory suggests that movements make minimal demands on working memory resources and can be used to assist in the acquisition of knowledge and skills (Sepp, Howard, Tindall-Ford, et al, 2019). Furthermore, in addition to simply seeing or hearing information, taking action in response to it creates a richer memory trace, supplying alternative avenues for recalling the information later (Chandler & Tricot, 2015). A third aspect of this discussion is the contribution movement can make to affective aspects of learning. The classic statement of this perspectives is, perhaps, that of the Norwegian musicologist Bjørkvold (1992), who linked play to children's cultural expectations such that it represents their "experimental laboratory for learning, where the conquest of reality - seen and unseen - is continually being anticipated" (p. 33). A related theme is fun and enjoyment, which often has a hedonic character, especially during early childhood (Dismore & Bailey, 2011). Fun and enjoyment are by far the most frequently cited reasons for children and young people to seek out movement opportunities (Bailey, Cope, Pearce, 2013: Visek, Achrati, Mannix, et al, 2015), and they seem to have a motivating effect by encouraging sustained and immersive engagement in learning (Immordino-Yang, Darling-Hammond & Krone, 2019).

There are two types of Active Learning: internal integration (when knowledge and skills are consciously selected and specifically taught as a significant part of the PA-based curriculum), and external integration (requiring the integration of PA within other subjects).

There are two broad categories of movement integration: internal and external integration (O'Sullivan and Placek, 1997). Internal integration happens when knowledge and skills are consciously selected and specifically taught as a significant part of the PA-based curriculum. Today, this type of integration is common in PE classrooms. For example, PE teachers integrate cognitive components such as tactical awareness as well as the teaching of specific health-related fitness concepts. For reasons mentioned

earlier, there are many affinities between PE and health, so it is not surprising to see integration of health education concepts in PE lessons in the empirical literature (Bartelink et al., 2018; Mâsse et al., 2013; O'Neill, et al., 2016). In some cases, such as the Michigan Model for Health, health education and PA are included as necessary content of a coherent curriculum (O'Neill, et al., 2016). A similar approach is used in the Dutch 'LekkerFit' programme, with its healthy lifestyle scheme including both PA and nutrition lessons (Bartelink et al. 2018). In addition, social interaction / personal development skills are integrated in a number of ways. Perhaps the most well-known model for this type of curriculum is Hellison's (2011) framework for 'Teaching Personal and Social Responsibility', which has especially influenced Spanish curriculum development (Camerino, Valero-Valenzuela, Prat, et al, 2019), based on the assumption that pro-social values can be effectively taught through the distinctive social context of PA sessions. Another example is the expectation of English schools to promote literacy, numeracy, health concepts, and Information and communications technology skills within PE lessons (Bailey, 2010). External integration, in contrast, requires the integration of PA within other subjects. This is "perhaps the most widely published about component of a whole-of-school approach to PA promotion" (McMullen, Martin, Jones, et al, 2016, p. 325). Examples of this type of Active Learning are discussed in greater detail in the next section.

7.2. Findings

Only one systematic review was found (Norris, Shelton, Dunsmuir, et al, 2015). The authors aimed to investigate the methods used in interventions aiming to promote PA through physically active lessons whilst maintaining academic time. 11 studies were identified, and all studies found improved PA following lessons with Active Learning, either in the whole intervention group or in specific demographics. Educational outcomes either significantly improved or were no different compared to inactive teaching.

The only systematic review of Active Learning found improved physical activity following Active Learning lessons. Educational outcomes either significantly improved or were no different compared to inactive teaching.

Source	Country of authors	Type of review	Age phase	Sample	Key findings
Norris, Shelton, Dunsmuir, et al (2015)	UK (England) & Australia	Systematic review	Any age group of school students	11 studies were identified: 5 examined PA outcomes only; 3 examined educational outcomes only; and 3 examined both PA and educational outcomes.	All studies found improved PA following physically active lessons: either in the whole intervention group or in specific demographics. Educational outcomes either significantly improved or were no different compared to inactive teaching.

Table 5: Systematic reviews - Active Learning

Empirical studies reported children's positive emotional response to the strategy (e.g., Mavilidi, Okely, Chandler, et al, 2016; Toumpaniari, et al, 2015; Vazou & Skrade, 2016). Vazou, et al (2012) reported:

> "The results of this study demonstrated that integrating PAs with the academic subjects in the classroom can significantly increase children's intrinsic motivation, perceived competence, and effort, without enhancing perceptions of pressure and negatively affecting the value of the lesson, compared to traditional lessons. As hypothesised, lessons integrating PAs were perceived as significantly more interesting and enjoyable among children from fourth to sixth grade compared to traditional lessons." (p. 259)

Since motivation is a core factor in educational success, this finding seems highly significant. The integrated approach includes activities that are very easy to apply, age-appropriate, and are not detriment to learning.

Studies of external integration have been carried out in numerous classroom-based subjects (Mullender-Wijnsma, Hartman, de Greeff, et al, 2016; Riley, Lubans, Holmes, et al, 2016).

Subject area	Source
First Language	Amico & Schaefer, 2020; Kosmas & Zaphiris, 2019; Mavilidi, Lubans, Morgan, et al, 2019; McMullen, Martin, Jones, et al, 2016
Mathematics	Hraste, De Giorgio, Jelaska, et al, 2018; Mavilidi, Okely, Chandler, et al, 2018; Mullender-Wijnsma, Hartman, de Greeff, et al, 2016; Riley, Lubans, Holmes, et al, 2016; van den Berg, Singh, Komen, et al, 2019; Vazou & Skrade, 2016; Vetter, O'Connor, O'Dwyer, et al, 2019
Science	Boyraz & Serin, 2017; Mavilidi, Okely, Chandler, et al, 2017
Foreign Languages	Mavilidi, M. F., Okely, A. D., Chandler, et al, 2015; Schmidt, Benzing, Wallman-Jones, et al, 2019; Toumpaniari, Loyens, Mavilidi, et al, 2015
Geography	Mavilidi, Okely, Chandler, et al, 2016; Vlček, Svobodová & Resnik Planinc, 2019
General academic performance	Mullender-Wijnsma, Hartman, de Greeff, et al, 2015; Vazou, Gavrilou, Mamalaki, et al, 2012; Lerum, Bartholomew, McKay, et al, 2019

Table 6: Curriculum areas and Active Learning

A group of Dutch researchers carried a series of studies in Active Learning (Mullender-Wijnsma, Hartman, de Greeff, et al, 2016; Mullender-Wijnsma, Hartman, de Greeff, et al, 2015). For example, Mullender-Wijnsma, Hartman, de Greef, et al. (2015) developed 61 physically active academic classroom lessons for second- and third-graders. The main focus of these activities was on repetition and memorization of reinforced concepts that children learned in the mathematics and language curriculum. Classroom observations showed that children's on-task behaviour during the lessons was above 70%., which is much higher than found with children in normal lessons. In addition, mathematics and language tests given after the physically active sessions were also significantly higher. Vazou & Skrade (2017) also integrated PA with mathematics over an 8-week period. Tests revealed improvement in mathematics performance in the integrated PA group was significantly larger compared to that of the control group. Similarly, the study by Beck, et al (2016) found that Active Learning can improve mathematical achievement, and that applying gross motor (large muscle groups, such as those involved with running) enriched mathematics lessons resulted in a greater improvement in mathematical performance compared to fine motor (small muscle groups, such as on the fingers) enriched academic lessons after a six-week intervention.

The most common focus of studies that have investigated effects of integrated PA on learning have focused on the mathematics. An exception is the study by Donnelly and Lambourne (2011), which focused on several academic content areas, including mathematics, geography, and science. The authors concluded that physically active academic lessons were enjoyable for teachers and students, and improved students' academic achievement scores. Mavilidi, Okely, Chandler, et al (2016) took a somewhat similar approach in their study into the effects of integrating task-relevant PAs into a geography learning task. They found that Active Learning conditions showed higher performance than those without PAs on an immediate retention test, and on a retention test administered 5 weeks later. In addition, children in the PA conditions enjoyed their learning method the most. Toumpaniari and her colleagues (2015) investigated whether combining both task-related PAs and gestures could improve learning even more in a 4-week intervention programme on foreign language vocabulary learning. Their results demonstrated that this combined method led to improvements in both learning of foreign words and enhanced motivation to do so. The results of studies by Mavilidi et al (2015) and Toumpaniari, et al (2015) show that children learned a foreign language vocabulary better when the learning task was combined with PAs relevant to the learning task than when it was combined with PA not relevant to the learning task, gestures related to the task, or with no activities at all.

The most common focus of studies that have investigated effects of integrated physical activity on learning focused on mathematics. Tests reveal Active Learning was associated with significantly improved results.

Each of these studies could be framed in terms of a single hypothesis: children in Active Learning conditions out-perform those in non-active conditions, in both immediate and delayed tests. This hypothesis was supported by the literature, although it is not clear 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 high standard deviations in findings. Or perhaps results were affected by the different types, intensities, and levels of activity in which children in the different conditions were involved, and the relevance of those PAs the cognitive tasks. It is interesting, in this regard, to note that mathematics seems to be particularly amendable to PA intervention (Singh, Saliasi, Uijtdewilligen, et al, 2019; Sneck, Viholainen, Syväoja, et al, 2019).

7.3. Examples of European Studies

Source	Country	Aim/Study	Findings
Cecchini & Carriedo (2020)	Spain	This study aimed to examine the effects of an interdisciplinary educational approach integrating PE and mathematics on LPA and MYPA, sedentary behaviour, and learning subtraction. 46 first-grade students (mean age 76.98 ± 3.74 months) wore accelerometers for 4 weeks to measure PA levels. For 3 weeks, one group attended PE and mathematic lessons separately (i.e., regular lessons); the other group was taught through a curriculum integrating PE and mathematics.	Students from the interdisciplinary group reached higher levels of LPA, MPA, and VPA, and spent less time in sedentary behaviour, than students that attended to regular classroom lessons. Moreover, the students from the interdisciplinary group achieved higher scores in subtraction learning.
Dyrstad, Kvalø, Alstveit, et al (2018)	Norway	The purpose of this paper was to evaluate the response to the physically active lessons and identify facilitators and barriers for implementation of an intervention lessons. This is a teaching method combining PA with academic content. 5 school leaders, 13 teachers and 30 children from the 5 intervention schools were interviewed about their experiences with a 10-month intervention, which consisted of	Physically active lessons were well-received among school leaders, teachers and children. The main facilitators for implementation of the physically active lessons were active leadership and teacher support, high self-efficacy regarding mastering the intervention, ease of organizing physically active lessons, inclusion of physically active lessons into the lesson curricula, and children's positive reception of the intervention.

		weekly minimum 2 x 45 minutes of physically active academic lessons, and the factors affecting its implementation.	The main barriers were unclear expectations, lack of knowledge and time to plan the physically active lessons, and the length of the physically active lessons (15–20 min lessons were preferred over the 45 min lessons).
Gammon, Morton, Atkin, et al, (2019)	UK	The objective of the study was to assess the feasibility, acceptability and costs of delivering a physically active lessons (PAL) training programme to secondary school teachers and explore preliminary effectiveness for reducing pupils' sedentary time. PAL training was delivered to teachers over two after-school sessions. Teachers were made aware of how to integrate movement into lessons; strategies included students collecting data from the environment for class activities and completing activities posted on classroom walls, instead of sitting at desks.	Teachers and students reported good acceptability of PAL training and mixed experiences of delivering PAL. Preliminary effectiveness for reducing students' sedentary time was not demonstrated in either study.
Schmidt, Benzing, Wallman-Jones, et al (2019)	Switzerland	The aim of the study was to investigate the effects of specifically designed PA on primary school children's foreign	Both the embodied learning and the PA condition were more effective in teaching children new words than the control condition. Children's focused

		language vocabulary learning and attentional performance. 104 children aged between 8 and 10 years were assigned to either (a) an embodied learning condition consisting of task-relevant PA, (b) a PA condition involving task-irrelevant PA, or (c) a control condition consisting of a sedentary teaching style. Within a 2-week teaching programme, consisting of 4 learning sessions, children had to learn 20 foreign language words.	attention, however, did not differ between the 3 conditions.

Table 7: European studies - Active Learning

7.4. Conclusion

Considered as a whole, these findings suggest that Active Learning is a cost-effective, enjoyable, motivating strategy to increase students' daily PA at school without undermining other educational goals. On the contrary, evidence suggests that effective Active Learning programmes 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 mostly likely to be realised in association with a series of conducive 'change mechanisms'. Successful implementation of Active Learning is associated with proactive leadership and teacher support, teacher efficacy regarding mastering the programmes, ease of organising Active Learning sessions, genuine inclusion of Active Learning into lesson curricula, and children's positive reception of the intervention. So, Active Learning will work most effectively when it is part of a whole-school approach to the promotion of PA in school.

Active Learning is a cost-effective, enjoyable, motivating strategy to increase students' daily PA at school without undermining other educational goals. On the contrary, evidence suggests effective Active Learning programmes can enhance academic performance.

8. Active Recess

SUMMARY

- Active Recess, promoting PA during the non-curricular time allocated by schools between lessons, promises to add a significant amount of activity to all European schools.
- Effective Active Recess strategies have been found to provide up to 40% of students' recommended daily PA, with greater benefits going to younger children and boys.
- There is a growing high quality scientific literature on Active Recess, although this research is of variable quality. There has been no European-level evaluation of the concept. The evidence for Active Recess is rated as MODERATE.

8.1. Background

All state schools in the European Union include recess or break times as part of their standard timetable, at both primary and secondary phases (European Commission & WHO Regional Office for Europe, 2018), with recess generally being understood as the non-curricular time allocated by schools between lessons for children to engage in PA and leisure activities (Parrish, Okely, Stanley, et al, 2013). Despite a growing international trend toward reallocating time in school to accentuate the more academic subjects, advocates for recess claim a range of cognitive, social, emotional, and physical benefits, as well as a break from the rigours of concentrated, academic challenges in the classroom (Baines & Blatchford, 2019). The American Academy of Pediatrics states that "recess is a crucial and necessary component of a child's development and, as such, it should not be withheld for punitive or academic reasons" (Murray & Ramstetter, 2013, p. 183).

Active Recess is the dedicated break time for children to engage in spontaneous or structured play outside the formal subject-content curriculum.

Since it presents an opportunity to engage almost all children and young people in healthy PA on a daily basis, in an environment that often includes space and facilities, recess has also been identified as a potentially valuable setting for the promotion of healthy behaviours, especially PA (Hyndman, 2017). Recent years have seen increasing interest in the promotion of children's PA during school recess using a number of different strategies, including the introduction of playground markings and games equipment (Parrish, Okely, Stanley, et al, 2013).

PA levels during recess have been measured primarily using quantitative measurements, such as accelerometers, heart rate monitors, or self-reported data (Dobbins, Husson, DeCorby, et al, 2013), with location and intensity of PA often recorded using observational systems (Anthamatten, Brink, Kingston, et al, 2014; Ridgers, Fairclough & Stratton, 2010a). The most widely used observational method is the System for Observing Play and Leisure Activity in Youth (SOPLAY; Anthamatten, Brink, Kingston, et al, 2014; Colabianchi, Maslow & Swayampakala, 2011; McKenzie, Crespo, Baquero, et al, 2010). Qualitative research in this area has used write-and-draw techniques to examine what children like and dislike about recess (Knowles, Parnell, Stratton, et al, 2013), as well different interview techniques (Pearce & Bailey, 2011), and ethnographical observation approaches (Pawlowski, Ergler, Tjørnhøj-Thomsen, et al, 2015).

Recent years have seen increasing interest in the promotion of children's PA during school recess using a number of different strategies, including the introduction of playground markings and games equipment.

8.2. Findings

6 reviews were found related to the relationship between school recess and PA (Broekhuizen, Scholten & De Vries, 2014; Escalante, García-Hermoso, Backx, et al, 2014; Ickes, Erwin & Beighle, 2013; Parrish, Okely, Stanley, et al, 2013; Reilly, Johnston, McIntosh, et al, 2016; Ridgers, Salmon, Parrish, et al, 2012).

Source	Country of authors	Type of review	Age phase	Sample	Key findings
Broekhuizen, Scholten & De Vries (2014)	Netherlands	Systematic review	2 – 18 years old	13 experimental and 17 observational studies	The experimental studies generated moderate evidence for an effect of the provision of play equipment, inconclusive evidence for an effect of the use of playground markings, allocating play space and for multi-component interventions, and no evidence for an effect of decreasing playground density, the promotion of PA by staff and

					increasing recess duration on children's health. In line with this, observational studies showed positive associations between play equipment and children's PA level. In contrast to experimental studies, significant associations were also found between children's PA and a decreased playground density and increased recess duration.
Escalante, García-Hermoso, Backx, et al (2014)	Spain & UK (Wales)	Systematic review	2 – 12 years	8 articles met the inclusion criteria	The results of these studies indicate that the strategies analyzed do have the potential to increase PA levels during recess. The cumulative evidence was (a) that interventions based on playground markings, game equipment, or a combination of the two, do not seem to increase the PA of preschoolers and schoolchildren during recess and (ii) that interventions based on playground markings plus physical structures do increase the PA of schoolchildren during recess in the short to medium term.

Ickes, Erwin & Beighle (2013)	US	Systematic review	Preschools and elementary/primary schools	13 interventions represented both settings within the U.S and internationally	A variety of strategies were used within the design and implementation of each of the interventions including: added equipment/materials, markings, zones, teacher involvement, active video games, activity of the week, and activity cards. Of the included studies, 95% demonstrated positive outcomes as a result of the recess intervention.
Parrish, Okely, Stanley, et al (2013)	Australia	Systematic review	5 – 18 years	9 articles met the inclusion criteria	The summary of the levels of evidence for intervention effects found inconclusive results for all intervention types, though promising strategies that require further investigation were identified. Five studies demonstrated a positive intervention effect on children's PA levels, with four reporting statistically significant increases and two reporting significant decreases in recess PA.
Reilly, Johnston, McIntosh, et al (2016)	UK (Scotland)	Systematic review	Primary and high school children	24 eligible studies of primary school students; 2 eligible studies of high school students.	Recess makes 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.
Ridgers, Salmon, Parrish, et al (2012)	Australia	Systematic review	5 – 18 years	53 studies	Positive associations were found between overall facility provision, unfixed equipment, and perceived encouragement and recess PA. Results also revealed that boys were more active than girls.

Table 8: Systematic reviews – Active Recess

The reviews suggest that recess has the potential to contribute about 40% towards daily PA recommendations (Parrish, Okely, Stanley, et al, 2013), and the school environment is recognised as a potentially valuable setting for PA initiatives, particularly schoolyards during recess (Dobbins, Husson, DeCorby, et al, 2013).

Empirical studies also suggest that Active Recess periods can contribute to improved fundamental movement skills, weight status, and cognitive performance (Pesce, Masci, Marchetti, et al, 2016; Pawlowski, Andersen, Troelsen, et al, 2016). However, PA behaviour during recess varies widely depending on the space in which recess takes place (Pawlowski, Tjørnhøj-Thomsen, Schipperijn, et al, 2014; Stanley, Boshoff & Dollman, 2012), facilities (Haug, Torsheim, Sallis, et al, 2010; Nielsen, Bugge, Hermansen, et al, 2012), gender (Andersen, Klinker, Toftager, et al, 2015; Ridgers, Salmon, Parrish, et al, 2012), and social grouping (Fairclough, Beighle, Erwin, et al, 2012; Pawlowski, Ergler, Tjørnhøj-Thomsen, et al, 2015).

Recess has the potential to contribute about 40% towards daily PA recommendations; the amount of moderate-to-vigorous physical activity during recess varies between 44% and 66%.

Previous studies in Europe and Australia found that recess PA was associated with aspects of the school physical environment, such as large play space (Ridgers, Fairclough & Stratton 2010b), adequate equipment (McKenzie, Crespo, Baquero, et al, 2010), playground markings (Baquet, Aucouturier, Gamelin, et al, 2018), and clear division by activity type have been reported to be effective in promoting PA during recess (Ickes, Erwin & Beighle, 2013). There is some evidence that the physical environment factors that affect PA during recess differ by culture or lifestyle of countries (Haug, Torsheim, Sallis, et

al, 2010). It has also been found that recess does not automatically generate PA (Coolkens, Ward, Seghers, et al, 2018).

The systematic observation literature shows that the amount of MVPA during recess varies between 44% and 66% (McKenzie, Crespo, Baquero, et al, 2010; Ridgers, Carter, Stratton, et al, 2011; Roberts, Fairclough, Ridgers, et al, 2013). Boys are generally more active than girls during recess, with boys typically spending about 50% of the time in MVPA (Roberts, Fairclough, Ridgers, et al, 2013). Boys tend to play in larger groups than girls, and engage more in sports activities, whereas girls mostly engaged in sedentary play (McKenzie, Crespo, Baquero, et al, 2010). Girls tend to engage in more prosocial behaviour (e.g., holding hands, helping or hugging each other, retrieving equipment for others) than boys, whereas boys engage in more anti-social behaviour (e.g., pushing, taking equipment from others, hitting) than girls (Roberts, Fairclough, Ridgers, et al, 2013). 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) on children's PA and the definition of recess used (Coolkens, Ward, Seghers, et al, 2018).

Playgrounds have become a focus of research into Active Recess (Broekhuizen, Scholten & De Vries, 2014; Escalante, García-Hermoso, Backx, et al, 2014; Hyndman, 2015). As already discussed, PA behaviour during recess can vary widely depending on schoolyard space (Pawlowski, Tjørnhøj-Thomsen, Schipperijn, et al, 2014), as well as gender (Andersen, Klinker, Toftager, et al, 2015), and social grouping (Pawlowski, Ergler, Tjørnhøj-Thomsen, et al, 2015). A somewhat anomalous finding came from a German study of the effects of the characteristics and use of playgrounds at primary schools on PA of 1,787 first and second graders (Möhrle, Steinacker, Szagun, et al, 2015). Researchers found that while boys met the recommended PA guideline of 60 minutes of MVPA on four or more days per week, PA levels were negatively associated with playground size. A positive association between playground design and PA, leading the researchers to conclude that Active Recess interventions should especially target girls, as they are already less physically active than boys at primary school age. An attractive playground design could, therefore, contribute to promote PA in girls.

Another strategy to enhance PA during recess has been the introduction of sporting activities (Erwin, Beighle, Carson, et al, 2013). A Belgian study investigated the participation of children in extra-curricular sport activities, finding that 76% of 11-year-olds reported participating at least once. Boys participated significantly more often than girls (83% vs 68%). Ball sports and dance were the most common activities (De Meester, Aelterman, Cardon, et al, 2014). The available research suggests that PA levels during

The introduction of sporting activities during recess is a potentially useful strategy to raise physical activity levels, although girls benefits less than boys.

recess are lower in older than in younger children and young people (Martinez-Gomez, Veiga, Zapatera, et al, 2014; Ridgers, Timperio, Crawford, et al, 2013). There is some evidence that children are less active during sporting activities compared with other forms of PA during recess (Elder, McKenzie, Arredondo, et al, 2011; Stellino, Sinclair, Partridge, et al, 2010), while others reported higher levels of MVPA for sports (Chin & Ludwig, 2014; Coolkens, Ward, Seghers, et al, 2018). Some studies investigating gender differences found that girls generally engage in less MVPA than boys during organised sport activities (Coolkens, Ward, Seghers, et al, 2018; McKenzie, Crespo, Baquero, et al, 2010), although some of the differences might be explained by the type and context of the activity (Parrish, Okely, Stanley, et al, 2013). Factors associated with higher levels of PA during recess included active supervision, participation of PE teachers and connection with PE lessons, students, positive perceptions of the playground environment, accessibility of spaces and equipment, use of outdoor space (Coolkens, Ward, Seghers, et al, 2018; Reilly, Johnston, McIntosh, et al, 2016). In addition, supportive school policies have been shown to be associated with increased PA during recess (Haug, Torsheim & Samdal, 2010).

8.3. Examples of European Studies

Source	Country	Aim/Study	Findings
Andersen, Klinker, Toftager, et al (2015)	Denmark	This paper aims to investigate how schoolchildren use different schoolyard areas during recess and whether these areas are associated with different levels of PA. Schoolyard behaviour was measured using GPS, accelerometer and GIS om different types of playground areas.	Grass and playground areas had the highest proportion of MVPA. Solid surface areas had the highest proportion of time spent sedentary. Girls accumulated more sedentary time in all area types compared to boys.
Blaes, Ridgers, Aucouturier, et al (2013)	France	The study aimed to assess the effects of playground marking on objectively measured school recess PA in French children. Accelerometry measured the effects of playground markings on the PA of 421 6-11-year-olds.	Painted playground markings had a positive short-term effect on school recess PA levels. There were no observed gender effects.
Haapala, Hirvensalo, Laine, et al (2014)	Finland	The study examined the changes in adolescents' recess and overall PA in secondary schools, and described the school actions	The proportion of students who participated in PAs at least sometimes increased from 30%

		to promote students' PA and the local contact persons' perceptions of the effects. PA was assessed with questionnaires to 789 secondary school students (Grades 7-9; mean age 14.1). Schools were offered ideas, and a mentor, to help them encourage PA during recess.	to 49%, and from 33% to 42% in ball games. Girls' participation in activities increased in the schools with gender-specific PA or facilities. Organised recess activities, student recess activators and equipment provision and sports facilities development were considered to have affected students' PA positively.
Frömel, Svozil, Chmelík, et al (2016)	Czech Republic	This study investigates school lifestyle among adolescents in terms of PA structure: (1) adolescents participating in a PE lesson versus (2) aggregate recess time exceeding 60 minutes. 24 secondary schools, with 433 students formed the sample. For the whole day (1-3 days) participants wore accelerometers, which monitored PA and heart rate.	Longer recess time (>60 minutes) had a significant effect on the volume of PA. A target of 500 steps/hours for PA was achieved by 83% of boys participating in PEL and 69% of girls. In contrast just 32% of non-participating boys and 31% of girls reached this level. With longer recess time the recommendation was met by 43% of boys (42% of girls) compared with 26% of boys (23% of girls) with shorter recess time.

Table 9: European studies – Active Recess

8.4. Conclusion

The available evidence suggests that recess can make a small-to-moderate contribution to students' PA at school, with greater benefits going to younger children and boys. At its best, recess can contribute up to 40% of the WHO recommendation of one hour per day of MVPA. More comprehensive positive outcomes require investment of time, resources, and adult participation, as well as policy commitments. If active recess is prioritised in schools, it would need to be supported by local and national surveillance. At present, there is little or no monitoring and evaluation of any aspect of recess in European countries.

Recess can make a small-to-moderate contribution to students' PA at school, with greater benefits going to younger children and boys.

9. Active Transport

SUMMARY

- To be added Active transport to and from school, such as walking or cycling, has been proposed as an important source of daily PA.
- Research demonstrates that walking and cycling to and from school are associated with increased MVPA, and Active Transport interventions are effective.
- Due to the quality and number of the scientific papers informing this domain, Active Transport is judged to be STRONG.

8.1. Background

Active Transport to and from school, such as walking or cycling, has been proposed as an important source of regular, daily PA (Interreg Europe, 2019; Larouche & Trudeau, 2010; Schönbach, Altenburg, Chinapaw, et al, 2019). There continue to be concerns expressed by public health experts and policy makers regarding insufficient volumes and intensities of PA of children and young people in Europe and other developed countries to improve health-related fitness (i.e., body composition, cardiorespiratory fitness, muscular fitness and flexibility). Given that transport is normally a necessity of everyday life, whereas leisure exercise such as going to a gym may be an additional burden, and is difficult to sustain long term (De Nazelle, Nieuwenhuijsen, Antó, et al, 2011), encouraging active travel may be a feasible approach to increasing levels of PA, active forms of travel are considered a potentially practical, cost-effective solution to a common problem (Villa-González, Barranco-Ruiz, Evenson, et al, 2018). The vast majority of children and young people need to make daily journeys to and from their schools and, especially in the case of primary schools, the distances between home and school are generally within the capacities of most students (Cope & Bailey, 2017). However, the prevalence of Active Transport has significantly declined in most countries over recent decades (Mammen, Stone, Faulkner, et al, 2014), with a few notable exceptions, including Belgium, Denmark, and the Netherlands (Hopkins & Mandic, 2017).

Active Transport incorporates all modes of transport relying on human power for propulsion, such as walking or cycling.

Research in this area is relatively under-developed (Yang & Diez-Roux, 2013), and the development of intervention studies in this area of research has been described as the least implemented measure associated with PA promotion in school, especially in secondary schools (Cardon, Van Acker, Seghers, et al, 2012). However, such comparisons depend on the settings being considered. Within the context of the HEPAS project, Active Transport is relatively well-researched, compared to other elements, such as Active Homework and Active Learning.

The methods used by the studies reported here entirely use quantitative methods. The table below summarises the main approaches used.

Method[6]	Example sources
Accelerometry	Aibar, Bois, Zaragoza Casterad, et al (2014); Chillón, Ortega, Ruiz, et al (2010); Chillón, Ortega, Ruiz, et al (2011)
Observation	Panter, Jones, Van Sluij, et al (2010)
Pedometers	Murtagh & Murphy (2011); Pabayo, Maximova, Spence, et al (2012);
Questionnaire	Henn, Schmocker, Reimers, et al (2014); Van Dyck, De Bourdeaudhuij, Cardon, et al (2010); Roth, Millett, & Mindell, 2012; Voss & Sandercock (2010).
Self-report diary	Daly-Smith, McKenna, Radley, et al, 2011)

Table 10: Data-gathering methods for Active Transport

Across these different methods, general patterns have emerged from the research literature that are of relevance to this report. 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 (Bosch, Wells, Lum, et al, 2010; Buttazzoni, Van Kesteren, Shah, et al, 2018). However, those students who do travel longer distance accrue greater amounts of PA and health benefits (Carver, Timperio, Hesketh, et al, 2010; De Meester, Van Dyck, De Bourdeaudhuij, et al, 2014).

Longer travel distances have been strongly connected to the decline in Active Transport. However, those students who do travel longer distance accrue greater amounts of physical activity and health benefits.

[6] See Glossary for explanations of methods.

From the point of view of this report, a useful concept to help understand these patterns is 'Independent Mobility' (Shaw, Bicker, Elliot, et al, 2015), or the ability of children and young people to walk or cycle around their neighbourhood without adult accompaniment. The report 'One False Move' popularised the idea Independent Mobility, within the context of a comparative study of German and English children (Hillman, Adams and Whitelegg, 1990). The study sought to measure children's freedom to travel around their own neighbourhoods without adult supervision, and included a set of behavioural indicators related to risks to children in the local environment, or 'parental licences', reflecting parental judgements about the degree of maturity and competence required by their children to cope safely with perceived dangers outside the home unaccompanied by an adult. Researchers found that there had been a decrease in children's independent mobility during the preceding 20 years, with half as many 7- to 10-year-olds allowed to go to places on their own. They also found that English children were much less likely to walk or cycle without their parents than German children in equivalent municipalities. Since that time, a number of studies have examined independent mobility in different settings and with different foci, but using the same basic methodology (Shaw, et al, 2012; Shaw, et al, 2013). The table below summarises the findings from a number of studies of independent mobility.

Source	Focus	Setting	Main Findings
Hillman, Adams & Whitelegg (1990)	Follow-up to the PSI 1971 study	England and Germany	9% of 7- and 8-year-old children got to school unaccompanied by an adult whilst levels of car ownership and use were fairly similar German children enjoyed far more freedom than their English counterparts; 80% of secondary school children were allowed to travel alone to places (other than school) within walking distance 30% of children under 10 years old were allowed to travel alone to places (other than school) within walking distance
Shaw, Watson, Frauendienst, et al, (2013)	Follow-up to the earlier PSI studies	England and Germany	50% of secondary school children in England were allowed to travel alone to places (other than school) within walking distance almost no children under 10 years old were allowed to travel alone to places (other than school) within walking distance

Shaw, Bicket, Elliott, et al (2015)	Follow-up to earlier PSI studies, with international comparison	Australia, Brazil, Denmark, England, Finland, France, Germany, Ireland, Israel, Italy, Japan, Norway, Portugal, South Africa, Sri Lanka and Sweden	Low levels of children's independent mobility are common, with significant restrictions placed on the independent mobility of children across all the ages studied (7- to 15-year-olds). Restrictions are greatest for children under 11 but even the oldest children are restricted in what they are allowed to do, at an age when many of the rights of adulthood are close to being granted Parents have significant concerns about letting their children go out alone with traffic seeming to be the strongest factor affecting the granting of independent mobility

Table 11: Key findings from studies of children's independent mobility

Traditions of walking and cycling vary enormously between individual European countries (Schönbach, Altenburg, Chinapaw, et al, 2019), and this might help explain may explain the current lack of knowledge about the effectiveness of intervention studies in the long term (Yang & Diez-Roux, 2013) despite cross-sectional findings of increased uptake of Active Transport when schools support the Active Transport concept (Hollein, Vašíčková, Bucksch, et al, 2017). One thing that is known is that the physical environment in which children and young people live has an impact on their travel patterns (Curtis, Babb & Olaru, 2015; Masoumi, 2017). Community density, diversity and design have consistently been linked with personal travel behaviour and are considered the most influential built environment factors on active travel (Ewing & Cervero, 2010). Perceptions of street safety, availability of pavements (sidewalks), crossings, general street connectedness, and commuting distance have been associated with more frequent active travel among children and young people (Helbich, Van Emmichoven, Dijst, et al, 2016; Masoumi, Zanoli, Papageorgiou, et al, 2017; Shamshiripour, Shabanpour, Golshani, et al, 2019; Van Loon & Frank, 2011). Some of these factors may be particularly problematic in rural areas, where safe street elements

The physical environment in which children and young people live has an impact on their travel patterns. Perceptions of street safety, availability of pavements, crossings, general street connectedness, and commuting distance have been associated with more frequent active travel.

(e.g., pavements and bicycle lanes) are less common, and schools are often located far from students' homes (Martínez-Martínez, Susana Aznar, Sixto González-Víllora, et al, 2019).

9.2. Findings

2 systematic reviews were found that examined the relationships between Active Transport and PA (Larouche, Saunders, Faulkner, et al, 2014; Martin, Kelly, Boyle, et al, 2016).

Source	Country of authors	Type of review	Age phase	Sample	Key findings
Larouche, Saunders, Faulkner, et al, 2014	Canada	Systematic review	5.0 to 17.9 years old	68 studies	The majority of studies found that Active School travellers were more active or that Active Transport interventions lead to increases in PA. All studies with relevant measures found a positive association between cycling to/from school and cardiovascular fitness.
Martin, Kelly, Boyle, et al (2016)	UK (Scotland)	Systematic review and meta-analysis	Primary & Secondary aged students	12 studies	The weighted mean MVPA accumulated in walking to and from school was 17 minutes per day in primary school pupils, and 13 minutes per day in high school pupils. Pooled analysis suggested that walking to and from school contributed 23% and 36% of MVPA on schooldays in primary school age children and high school pupils, respectively.

Table 12: Systematic Reviews – Active Transport

The Scottish review (Martin, Kelly, Boyle, et al, 2016) estimated the contribution of walking to and from school to objectively measured daily MVPA in individuals and populations, focusing the results of 12 studies. The weighted mean MVPA from these studies accumulated in walking to and from school was 17 minutes per day in primary school pupils, and 13 minutes per day in secondary pupils. Pooled analysis suggested that walking to and from school contributed 23% and 36% of MVPA on school days

in primary and school secondary age children, respectively. Importantly, all included studies were of high methodological quality, suggesting that the findings warrant confidence.

Walking to and from school contributes 23% and 36% of MVPA on school days in primary and school secondary age children, respectively.

The vast majority of the 68 studies reviewed by Larouche, Saunders, Faulkner, et al (2014) showed a positive relationship between Active Transport and PA levels, as well as positive associations with health outcomes. Specifically, Active Transport through cycling was clearly linked with improvements in cardiorespiratory fitness. Overall, 81.6% of the studies (including 2 randomised controlled trials) showed that Active Transport was associated with significantly higher PA levels, despite limitations of accelerometers and pedometers in measuring PA during cycling. Further, there is some evidence of a dose-response effect, albeit mediated by the effects of gender and age. In light of evidence that most Active Transport interventions lead to increases in the proportion of children and young people walking and cycling to school (Jones, Blackburn, Woods, et al, 2019; Villa-González, Barranco-Ruiz, Evenson, et al, 2018), the reviewers conclude that Active Transport "should be promoted to increase PA levels in children and adolescents" (p. 206). However, presumably due to the larger sample of articles included in the analysis, the overall quality of evidence in this review was judged to be moderate, suggesting some caution in interpreting the results.

Reviews show Active Transport is associated with higher levels of physical activity, and the more students walk or cycle, the better the health benefits.

An additional systematic review was found that examined the potential health benefits associated with Active Transport among children and adolescents (Lubans, Boreham, Kelly, et al, 2011). As this paper did not specifically address the issue of PA, it has not been included above. However, it is obviously indirectly relevant, and warrants mention. 48% of the studies that examined the relationship between Active Transport and weight status/body composition reported significant associations, increasing to 55% once poor-quality studies were removed. Furthermore, the findings from five studies, including one longitudinal study, indicate that ATS is positively associated with cardiorespiratory fitness in youth. However, the evidence for the relationships between ATS and muscular fitness or flexibility is equivocal and limited by low study numbers.

The primary empirical literature consistently reports that Active Transport is associated with increased levels of PA, and higher levels compared those using motorised modes of transports (Chillón, Ortega, Ruiz, et al, 2010; Larouche, Saunders, Faulkner, et al, 2014). They are also more likely to meet daily PA recommendations (Chillón et al., 2010; Roth, Millett, & Mindell, 2012). For example, a study of Estonian and Swedish children and adolescents aged 9—10 years and 15—16 years found generally higher levels

of daily PA across all groups, especially in boys, 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 compared to females (Chillón, Ortega, Ruiz, et al., 2011). Another interesting example comes from the Netherlands (Slingerland, Borghouts & Hesselink, 2012). Researchers used a combination of heart rate monitors, accelerometers, and activity dairies to measure adolescents' PA energy expenditure associated with Active Transport to and from school, PE, and leisure time activities, and found that Active Transport contributed an average 30% of school-related PA (nearly twice that of PE lessons), and 15% of total PA. The authors argue that programmes aimed at increasing Active Transport to school should become a specific target for advocacy.

A multi-European-country reported the findings of a recent survey of students in 21 primary/elementary schools in 9 cities in 7 European countries (Foggia, Italy; Berlin, Germany; Thessaloniki, Greece; Rijeka, Croatia; Utrecht, The Netherlands; Łódź, Poland; Konstantynow, Poland; Malatya, Turkey, and Doğanşehir, Turkey; Masoumi, Zanoli, Papageorgiou, et al, 2017). The objective of the survey was to provide data covering several topics in relation with active commuting to school and BMI, such as parental perceptions of safety and security, neighbourhood facilities, land use characteristics, etc. in different regions of Europe in a way that cross-sectional comparisons between regions and city sizes is facilitated. Self-reported survey data were gathered from 1,304 children regarding demographics, travel patterns, and perceptions of school transport. A large proportion of the student used Active Transport, with 58% walking and 8% cycling to and from school. There was considerable variation between the cities. For example, 35% of the Foggia group travelled to school by car, while only 10% and 11% from Utrecht and Berliners, respectively, used cars. Cities with warmer climates (i.e., Malatya, Doğanşehir and Rijeka) had even less car use. In addition to weather, parental shopping habits, perceptions of the local neighbourhood, whether or not mother work, and children's bicycle ownership correlated with likelihood to used Active Transport methods. This multi-country study supplements earlier European research into Active Transport. A study in Sweden (Chillón, Ortega, Ruiz, et al, 2012) tested whether modes of commuting to school and changes in commuting were associated with 6-year changes in youth. 34% of children used passive modes of commuting (e.g., car, motorcycle, bus, train), 54% walked, and 12% bicycled to school. 6 years later the percentage of bicyclists increased 19% and the percentage of walkers decreased 19%. Overall, those who bicycled to school increased their fitness 13% more than those using passive modes, and 20% more than those who walked. Those who changed

A Norwegian project reported boys who cycled to school had lower skinfold measurements and better cardiorespiratory fitness than those who walked or took passive transport. Those who cycled or walk to school had higher muscle endurance compared to those who used passive modes.

from passive modes and walking to cycling increased their fitness 14% more than those who remained using passive modes or walking 6 years later. A Norwegian project (Østergaard, Kolle, Steene-Johannessen, et al, 2013) collected data from 1694 9-to-15-year-old students in 40 primary/elementary schools and 23 secondary/high schools. Adolescent males who cycled to school had lower skinfold measurements than those who walked. Better cardiorespiratory fitness in male cyclists compared to walkers and passive commuters were observed. Children who cycled or walk to school had higher muscle endurance compared to those who used passive modes. Finally, Spanish study collected data from 956 children in 18 public in rural areas (Gutiérrez-Zornoza, Sánchez-López, García-Hermoso, et al, 2015). It was found that students living less than 600m commuted actively to school more frequently than those living further away. Heathy weight boys lived further away from sports facilities than their overweight/obese peers, while children presenting higher cardiometabolic risk levels lived closer to school than those who did not. No differences were found between students who walked or cycled to school and those commuting actively to school less frequently in BMI, metabolic syndrome index, fitness, and PA.

The association between travel mode and PA may be moderated by sex, although how this happens is not clear (Smith, Sahlqvist, Ogilvie, et al, 2012). German researchers found stronger associations in boys than in girls, whereas (Kobel, Wartha & Steinacker, et al, 2019; Smith, Sahlqvist, Ogilvie, et al, 2012), whereas British studies found stronger associations in girls (Panter, Jones, Van Sluij, et al, 2010). Generally speaking, however, research has shown that the prevalence of active commuting is greatest among boys (Johnson, Brusseau, Darst, et al, 2010; Larouche, Saunders, Faulkner, et al, 2014).

9.3. Examples of European Studies

Source	Country	Aim/Study	Findings
Camiletti-Moirón, Timperio, Veitch, et al (2020)	Spain	This study aimed to: 1) describe longitudinal changes in Active Transport, LPA, MVPA, physical fitness and adiposity indicators over 3 time-points; and 2) investigate the mediating role of LPA and MVPA levels on associations between Active Transport and physical fitness and adiposity indicators over 3 time-points among children and adolescents. 1,646 Spanish children and adolescents self-reported data	There was observed decreases in LPA over time. Active Transport was directly positively associated with MVPA. Participating in more Active Transport may help attenuate declines in MVPA that typically occur with age and improve cardiorespiratory fitness.

		about mode of commuting, and PA through accelerometers. Other measurements were made for strength and BMI.	
Klinker, Schipperijn, Christian, et al (2014)	Denmark	The purpose of this study is to identify and assess domains (leisure, school, transport, home) and subdomains (e.g., recess, playgrounds, and urban green space) for week day MVPA using objective measures and investigate gender and age differences. 367 Danish 11–16-year-olds provided accelerometer and Global Positioning System data (mean 2.5 days, 12.7 hrs/day). 15-second epochs were measured to determine PA and assign epochs to domains and subdomains. Frequencies and proportions of time spent in MVPA were determined and differences assessed using multi-level modelling.	Boys accumulated more MVPA overall, in leisure, school and transport. Children compared with adolescents accumulated more MVPA, primarily through more school MVPA. Boys spent a large proportion of time accumulating MVPA in playgrounds, Active Transport, PE, sports facilities, urban green space and school grounds. Girls spent a significant proportion of time accumulating MVPA in Active Transport and playgrounds. No gender or age differences were found in the home domain.
Roth, Millett & Mindell (2012)	UK	The objective was to assess the contribution of 4,468 5-15-year-old students' active travel to and from school to children's overall PA levels in England. The method was the analysis of the nationally-representative 'Health Survey for England', validated against a sub-set of 303 students' accelerometry data.	The 64% of children who walked and the 3% who cycled to/from school were more active than the 33% who did neither. Typical walkers came from a deprived area and were less likely to have a limiting illness; typical cyclists were older, male, and most likely to meet the recommendations. For self-reported activity, time spent cycling to/from school contributed more to meeting the recommendations than time spent walking to/from school or in sports. Time spent walking to

			school and in sports were significantly associated with being in the highest tertile accelerometry -measured activity.
Slingerland, Borghouts & Hesselink (2012)	Netherlands	This study investigated the contribution of Active Transport to and from school, PE, and leisure time activities to total PA energy expenditure during a regular school week in adolescents. 73 adolescents (mean age: 15.7 years) wore an individually calibrated combined heart rate-accelerometer and kept an activity diary during a regular school week.	Active Transport contributed an average 30% of school-related PA (nearly twice that of PE lessons), and 15% of total PA. The authors argue that programmes aimed at increasing Active Transport to school should become a specific target for advocacy..

Table 13: European studies – Active Transport

9.4. Conclusion

Active Transport is a low-cost and sustainable behaviour that numerous studies suggest is an effective strategy to increase children and young people's PA, for both girls and boys. 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 have been shown to be effective. However, current patterns of Active Transportation in Europe are cause for concern, and the levels of walking and cycling to school is decreasing. Due to the quality and number of the scientific papers informing this domain, Active Transport is judged to be STRONG.

Active Transport is a low-cost and sustainable behaviour that numerous studies suggest is an effective strategy to increase children and young people's physical activity.

Physical Education as a Setting

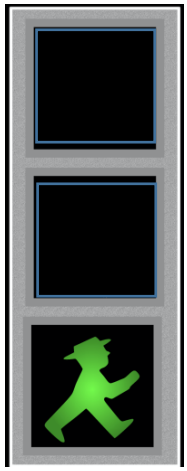
10. Curriculum Physical Education Lessons

SUMMARY

- PE has a unique position in school-based PA promotion as the only protected, regular, supervised setting for PA during the school day.

  Students are more active during PE lessons than in any other context, but generally fail to reach a target of 50% of lessons at MVPA.

- Due to the relatively large number of reviews and empirical studies in this area, publication quality, and consistency if findings, PE is rated STRONG.



10.1. Background

Much school time is spent seated, with opportunities for PA traditionally limited to PE and recess, and in an era of pandemical inactivity, there have been many calls to expand, extend and enhance opportunities for children and youth PA (Beets, Okely, Weaver, et al, 2016; Sygusch, Brehm, Seidel, et al, 2010; Sujová & Vladovičová, 2016). PE, in particular has been singled out as a potentially valuable setting for expansion, largely due to its unique position as a protected, regular, supervised context for the promotion of PA, and constituent movement skills (European Parliamentary Research Service, 2015; WHO Regional Office for Europe, 2018). This position is stated clearly by Eurydice Report:

Curriculum physical education is in a unique position as a protected, regular, supervised context for the promotion of physical activity and movement skills

> "During childhood and youth, physical education at school provides an excellent opportunity to learn and practise skills likely to enhance lifelong fitness and good health." (European Commission/EACEA/Eurydice, 2013, p. 7)

Many European countries have established time and other requirements for PE in schools. In the UK, for example, there is a requirement for schools to provide at least two hours per week of PE for all students aged from five to 16 (Department of Education, 2013; Tittlbach & Sygusch, 2014). In Germany, three 45-minute PE classes are recommended per week to average approximately 100 weekly minutes (Deutscher Olympischer Sportbund, 2006). Despite an explicit acknowledgement of the importance of

PE by policy makers, there is a widely shared concern that its potential benefits have been rarely realised (Hardman, 2011a; UNESCO, 2013). An influential report from the United States summarises some of the current concerns as follows:

> "Physical education has traditionally been the primary role played by schools in promoting physical activity. Despite the effectiveness of quality physical education in increasing physical activity, however, challenges exist to its equitable and effective delivery. Fiscal pressures, resulting in teacher layoffs or reassignments and a lack of equipment and other resources, can inhibit the offering of quality physical education in some schools and districts. Schools may lack trained physical educators, and safety issues are associated with allowing children to play. Policy pressures, such as a demand for raising standardized test scores through increased classroom contact time, further challenge the role of school physical education in providing physical activity for youth." (Kohl & Cook, 2013, S3-S4)

Similar concerns and elsewhere have been expressed within the context of Europe (European Commission/EACEA/Eurydice, 2013), raising doubts about the value of PE as a key source of PA. Research reports presented to the International Conference of Ministers and Senior Officials Responsible for Physical Education and Sport (MINEPS) in Russia in 2017 broadly reinforce a number of findings:

- PE is generally considered to be a low-status subject;
- There are significant differences between the PE curriculum requirement and the implementation in schools, so even when the subject was a compulsory part of the school curriculum, it was sometimes not taught at all;
- The greatest time allocation occurred when the children were aged 9-14, and that the time allocated in schools declined as the children got older, when it either became an optional subject or not an option at all;
- Time for PAs and sport was often extended through extra-curricular activities. In some cases, this was very well developed, in others much less so;
- Limits to funding and resourcing meant that many schools were unable to deliver a comprehensive, or even coherent curriculum, and this was especially the case in the developing world;

Despite the effectiveness of quality physical education in increasing physical activity, challenges exist to its delivery, including financial pressures, lack of trained teachers, safety issues and policy pressures.

- Specialist teachers during the primary phase were rare, and in some cases, PE teacher training for generalist primary teachers was extremely poor;
- Equity, especially in terms of gender and disability, meant that many children were marginalised from quality PE experiences, or excluded completely (Bailey, 2017b).

These contextual findings are likely to impact on all aspect of PE, and it is reasonable to suppose that they will mediate the effectiveness of the subject's capability to support the promotion of PA (Breda, Jakovljevic, Rathmes, et al, 2018; Hanssen-Doose, Albrecht, Schmidt, et al, 2018). Kohl & Cook, 2013). This is compounded by research suggesting that the benefits of participation in PE and PA are not solely dependent on the activities themselves, but also on a certain quality of provision and pedagogy through which they are presented (Bailey, Armour, Kirk, et al, 2009; Harris, 2014; Ptack, Tittlbach, Brandl-Bredenbeck, et al, 2019; Whitelaw, Teuton, Swift, et al, 2010).

The benefits of participation in physical education and physical activity are not solely dependent on the activities themselves, but also on a certain quality of provision and pedagogy through which they are presented.

This review focuses on the contribution that PE lessons can make to students' PA. Methods to assess PA can be roughly split up in subjective and objective approaches. Subjective measures include questionnaires, interviews, activity diaries and direct observation, while objective measures include devices such as heart rate monitoring, accelerometry, and pedometry (Thomas, Nelson & Silverman, 2015). A challenge for research in this area is that PA behaviour consists of different dimensions, such as intensity, frequency and duration (which together comprise the volume of PA), as well as activity type and activity setting. No single method of PA assessment is able to capture all these dimensions simultaneously, since each method has own advantages and disadvantages (McKenzie & Van Der Mars, 2015).

10.2. Findings

Six systematic reviews of the scientific literature were identified that related directly the question of PE's contribution to children and young people's PA.

Source	Country of authors	Type of review	Age phase	Sample	Key findings
Dudley, Okely, Pearson, et al (2011)	Australia	Systematic	Primary & Secondary	23 articles met the inclusion criteria, published from January 1990 up to and including June 2010	Evidence was found that the most effective strategies to increase children's levels of PA and improve movement skill proficiency in primary schools was: • prioritising direct instruction • following a prescribed curriculum • adopting a whole-school approach to PA • providing teachers with sufficient, on-going professional development in using PE instruction methods and curriculum For secondary schools: • using a combination of prescribed PE and school sport curriculum with elements of student choice • substantial teacher professional development combined with sufficient teaching resources
Errisuriz, Golaszewski, Born, et al (2018)	US	Systematic	Primary	12 relevant studies from 1991 to 2014	• PE interventions consistently showed increases in MVPA or VPA during PE class, but were less consistent in impacting leisure-time PA.
Hollis, Sutherland, Williams, et al (2016)	Australia	Systematic	Secondary	28 articles published between 2005 and 2014 from 7 countries	• Meta-analysis of 15 of the studies found that overall, 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%.

Hollis, Williams, Sutherland, et al (2017)	Australia	Systematic	Primary	13 articles published between 1991 to April 2014 from 9 countries were included	• PE lesson time spent in MVPA ranged between 11.4 - 88.5%. • Meta-analysis of 7 studies (4 direct observation; 3accelerometers) found children spent a mean 44.8% of PE lesson time in MVPA.
Lonsdale, Rosenkranz, Peralta, et al (2013)	Australia	Systematic	Primary & Secondary	14 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 • This increase could have a substantial positive influence on the total amount of PA accumulated. • Professional learning focused on teacher pedagogy and behaviour offers considerable potential for increasing PA in youth.
Zhou & Wang (2019)	China	Systematic	Secondary	55 studies were identified (43 judged to be medium and high quality by methodological quality assessment)	These variables were 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: • class gender (girls-only)

					• PE activities (movement activities) • lesson context (knowledge)

Table 14: Systematic reviews – Physical Education

As can be seen in the table, the reviews analysed different numbers and types of articles, and arrived at somewhat different findings. For example, some reviews focused on primary-aged students (Errisuriz, Golaszewski, Born, et al, 2018; Hollis, Williams, Sutherland, et al, 2017), others secondary students (Hollis, Sutherland, Williams, et al, 2016; Zhou & Wang, 2019), and a third group included both primary and secondary students in their remit (Dudley, Okely, Pearson, et al, 2011; Lonsdale, Rosenkranz, Peralta, et al, 2013).

Meta-analyses of non-intervention studies by Hollis of primary (Hollis, Williams, Sutherland, et al, 2017) and secondary school (Hollis, Sutherland, Williams, et al, 2016) settings reported that, overall, students spent a mean 44.8% and 40.5% of PE in MVPA, respectively.

In light of the relatively high number of published papers on this topic, the discussion of individual empirical studies will focus on Europe.

10.3. European Studies

Source	Country of study	Data-gathering method	Sample	Key findings
Ferreira, Mota & Duarte (2013)	Portugal	Accelerometry	98 males (14.51 ± 1.75 years) and 93 females (14.59 ± 1.83 years)	The mean time spent in MVPA during PE class was 25.36±15.69 minutes, which corresponds to 28.18% of the total time spent in PE class. Males spent significantly more time in MVPA than females (28.95 vs. 21.58 minutes). As age increased, time spent in MVPA in PE tended to decrease.
Fröberg, Raustorp, Pagels, et al (2017)	Sweden	Accelerometry and observation	39 PE lessons	On average, 25% of PE lessons were spent in MVPA and the mean %MVPA varied with lesson content, with fitness, orienteering and playing games being the most intense. The highest %MVPA was in the fitness category, providing 33% (8–62%) for girls and 37% (7–72%) for boys. With the exception of the second

				grade, no significant gender differences in %MVPA were seen.
Groffik, Mitáš, Jakubec, et al (2020)	Poland & Czech Republic	Accelerometry, pedometers., questionnaire	17 Polish and 23 Czech secondary schools (N = 921; mean age = 16.2 ± 0.7 years	The Polish education system enabled adolescents to meet the recommendations for MVPA more likely than did the Czech system. PA also represented a higher portion of daily PA in the Polish; however, the differences in total daily step count between Polish and Czech adolescents were non-significant. PA accounted for 30–37% of the daily PA of Polish girls (23–30% of Czech girls) and 28–39% of Polish boys (25–37% of Czech boys).
Guijarro, Rocamora, González-Víllora, et al (2019)	Spain	Anthropometry.	84 students (43 boys and 41 girls) of fifth and sixth grade (mean 11.2 years,)	Sport Education helped the achievement of a greater MVPA percentage than the Direct Instruction in both genders, with a varying contribution of the different phases.
Howells, Wellard & Woolf-May (2020)	UK (England)	Accelerometry	10 participants, 5 girls (mean age at start of data collection was 6 years, 6 months) and 5 boys (mean age at start of data collection was 6 years 4 months)	Boys achieved 88% and girls 70% of the recommended daily PA levels on PE days compared to 77% (girls 63%) on non-PE days. Significant differences occurred, boys more active than girls, also PE days were more active than non-PE days.
Meyer, Roth, Zahner, et al (2013)	Switzerland	Accelerometry	676 children (9.3±2.1 years	Children spent 32.8±15.1% of PE time in MVPA. MVPA during PE accounted for

				16.8±8.5% of MVPA during the school day, and 17.5±8.2% in overweight children. All children were more active on days with PE than on days without PE Although MVPA was low, PE played a considerable role in providing PA and was not compensated by reducing extra-curricular MVPA.
Mooses, Pihu, Riso, et al (2017)	Estonia	Accelerometry	504 first (ages 7-9) and second (ages 10-12) school level children	In PE, students spent 28.6±16.5% in MVPA and 29.3±19.8% in sedentary time. Each additional MVPA minute in PE was associated with 1.4 more daily MVPA minutes. On days with PE, students had 12.8 minutes more MVPA and 9.7 minutes less sedentary time compared with days without PE.
Lyyra, Heikinaro-Johansson & Lyyra (2017)	Finland	Heart rate monitoring	821 students (mean age 13.81±0.73 from 14 schools	The mean heart rate across the data set was 135 beats per minute and students engaged in MVPA 41% of lesson time. Students were most active during games lessons and there was an evident gender difference, with boys being more active. However, when the impact of lesson content and gender on PA were tested, the impact of gender was no longer significant. The findings indicate that the gender difference in the activity levels was rooted in having different lesson content

				with boys having games lessons more often than girls.
Rooney & McKee (2018)	UK (Northern Ireland)	Anthropometry	61 children (9.3+1.0 years)	Children accumulated 63.3±18.2 minutes in MVPA (daily) compared to 61.3+23.4 minutes (PE day) and 63.0+22.5 minutes (non-PE day). This indicates children were not significantly more active on PE days compared to non-PE days. PE contributed only 6.4% of children's overall MVPA, while break time (morning recess) and lunchtime (afternoon recess) contributed to 18.7% and 18.4% respectively. This indicates there was a significant difference in the percentage of time spent in MVPA that all children participated in during PE classes compared to both break time and lunch time MVPA.
Sacchetti, Ceciliani, Garulli, et al (2013)	Italy	Self-administered questionnaire	127 boys & 120 girls) (aged 8-9 years), with a control given a traditional (129 boys; 121 girls) PE programme	The PE intervention was effective in improving physical abilities of children and determining a decrease (boys: 10%; girls: 12%) in daily sedentary activities. The percentages of overweight and obese children did not vary significantly, but the experimental group showed a significantly lower rise in BMI compared to the control group.

Salin, Huhtiniemi, Watt, et al (2019)	Finland	Accelerometry	309 girls, 283 boys, aged 11-12	Contrasts regarding activity quartiles revealed that in the least active group quartile (Q1) boys had more sedentary time and less MVPA time than in the more active group quartiles (Q3&Q4). Among girls, Q1 girls had less MVPA than girls grouped in Q3-Q4, and had more sedentary time than all other quartile groups. Results demonstrated that differences in activity between children with different MVPA levels exist during PE lessons.
Singerland, Oomen & Borghouts (2011)	Netherlands	Heart rate monitoring	913 students in 40 schools, aged between 13- and 18-years of age	Overall percentages lesson time in MVPA were 46.7% and 40.1% during primary school and secondary school PE, respectively. Results indicated a sharp decline in girls' PE intensity levels at the beginning of secondary school. Furthermore, secondary school boys were more active than girls.
Viciana, Mayorga-Vega & Martínez-Baena (2016)	Spain	Accelerometry	231 adolescents, 14.6 ± 1.2 years old	The highest MVPA levels were in after-school sport, followed by PE, and then recess. However, taking into account the total time considered for each of the periods, PE was the period where the adolescents were involved in a higher percentage of MVPA (26.7%).

Table 15: Empirical studies of PA during PE lessons

It has been suggested that students should participate in MVPA for 50% of PE lesson time to gain appropriate health and academic benefits (AfPE, 2015; CDC, 2010). 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 (Hollis, Sutherland, Williams, et al, 2016; Hollis, Williams, Sutherland, et al, 2017). 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%), but the detailed meta-analysis found children spent a mean 44.8% of PE lesson time in MVPA (Hollis, Williams, Sutherland, et al, 2017). 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. Meta-analysis found children spent a mean 44.8% of PE lesson time in MVPA.

Students should participate in moderate-to-vigorous physical activity for 50% of PE lesson time to gain appropriate health and academic benefits.

More positively, there is evidence that it is possible to increase the levels of PA in PE levels. Dudley, Okely, Pearson, et al's (2011) review identified a number of actions that are characteristic of effective teaching for PA promotion, including direct instruction (i.e., explicit teaching of specific skill) 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 (2019). More important, perhaps, is the role played by specific teacher professional development to enhance their ability to create physically active PE lessons, especially during the primary phase (Lonsdale, Rosenkranz, Peralta, et al, 2013). An Italian study (Sacchetti, Ceciliani, Garulli, et al, 2013) partnered a generalist primary school teacher with specialist PE teacher, support students' PA in PE lessons, recess and classrooms. The outcome was a significant decrease in sedentary behaviour across the school week.

Girls tend to be less active in physical education lessons than boys, but this can be corrected with appropriate pedagogy and planning.

A clear pattern in the literature is the role of gender as a mediating variable in PA levels in PE lessons (Ferreira, Mota & Duarte, 2013; Fröberg, Raustorp, Pagels, 2017; Singerland, Oomen & Borghouts, 2011; Zhou & Wang, 2019), and this seems to be the case irrespective of the country in which the study takes place. However, there is convincing evidence that appropriate interventions can address the deficit of girls' PA (Fröberg, Raustorp, Pagels, et al, 2017). There is some evidence that the adoption of model-based (e.g., Sport Education) and teacher-led pedagogies can contribute to enhanced PA (Guijarro, Rocamora, González-Víllora, et al, 2019). A Finnish study (Lyyra, Heikinaro-Johansson & Lyyra, 2017) used multi-level logistic regression to get a clearer picture of the causes of gender differences in

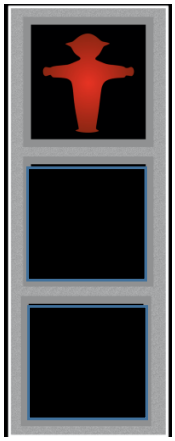
PA, and found that when the impact of lesson content and gender on PA were tested simultaneously, the impact of gender was no longer significant. This suggests that the gender difference in PA levels was rooted in having different lessons content for gender groups with boys having games more often than girls do. Swedish researchers found that some ways of organising 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 minutes of MVPA (Fröberg, Raustorp, Pagels, et al., 2017). So, developing lesson strategies to foster consistency in student engagement in PE, especially in reducing sedentary behaviour and increasing MVPA, could have a strong effect on overall PA levels.

Many lessons fail to achieve the target of 50% moderate-to-vigorous physical activity. The type of activity (sport is most beneficial) and gender-relevant approaches are important considerations.

10.4. Conclusion

This review sought to assess the contribution that the PE lessons can make to students' PA levels. It has been suggested that all lessons should involve at least 50% of MVPA engagement MVPA engagement. This review shows that 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 that included in lessons. Sporting games seem to be especially valuable in promoting MVPA, and of these, invasion-based games were most effective of all. Reconsidering the activities offered to girls and boys seems to be a necessary step in order to develop inclusive, equitable PA opportunities.

11. Teacher Education & Workforce



SUMMARY

- PETE and workforce training are vital elements in the implementation of effective practice, and this may be especially the case when innovations are introduced.
- No directly relevant reviews or empirical studies were identified to inform discussion of this topic, and the only indirectly related article reported limited impact of professional training in HEPA promotion.
- In light of the poor evidence base, Teacher Education and Workforce is rated WEAK.

11.2. Background

Numerous authors have argued that an important corollary of the concept of Active Schools is that schools' staff will become more involved as leaders in promoting and delivering PA (Brandl-Bredenbeck & Sygusch, 2017; Carson, 2012; Kwon, Kulinna, Van Der Mars, et al, 2018; Mulhearn, Kulinna & Webster, 2020). Some have also suggested that, in order to implement the Active Schools concept successfully, it should be coordinated by a suitably qualified leader, such as a teacher (Erwin, Beighle, Carson, Castelli, Kuhn, et al, 2014). In principle, any teacher or member of support staff could take this, and this may be necessary in primary schools, where there can be no teacher with specialist professional education related to PA. Of course, this would require additional workforce training and support (Prusak, 2019). A school's PE teacher is an obvious candidate for this leadership role (Carson, 2012), presumably taking on a wider role that includes not only teaching PE lessons, but also promoting daily PA across the school (Dauenhauer, Carson, Krause, et al, 2018). PE teachers may be the only members of school staff who have been prepared and professionally trained to work with students in PA settings, although training institutions might need to consider how they train, prepare, and effectively equip prospective PE teachers for the expanded role implicit within the Active School concept (Karp, Scruggs, Brown, et al, 2014). Several authors have

PE teachers may be the only members of school of staff professionally trained to work with students in physical activity settings, although training institutions might need to consider how they train, prepare, and effectively equip prospective teachers for the expanded role implicit within the Active School concept.

proposed recommendations about the PE teacher education (PETE) needed to perform expanded roles related to PA promotion (Webster, Webster, Russ, et al, 2015). The most common of these recommendations is for PETE programmes to help student teachers learn to lead and coordinate PA promotion efforts at school, in communities, and in the home environment (Webster & Nesbitt, 2017).

Hattie's (2012) synthesis of more than 800 meta-analysis found that teaching quality was the strongest school-related factor in improving student learning and achievement. Since the majority of school-based PA programmes draw on existing teachers (rather than visiting specialists) to deliver interventions (Russ, Webster, Beets, et al, 2015), recruiting teachers with suitable expertise and professionally developing existing staff are necessary conditions to encourage the long-term change process required for school-based PA (Webster, 2011). In addition, sustainable change in health behaviours is unlikely to occur using traditional approaches to PA in school, so there is a need for professional education to promote on-going teacher learning and improve teacher instructional practices (Murphy & O'Leary, 2012). Teacher education, in general, has been found to play a significant role in ensuring teacher readiness with regard to delivering new programmes in schools (Lander, Eather, Morgan, et al, 2017). However, many concerns have been expressed regarding the quality and relevance of some teacher education programmes (Tannehill, Demirhan, Čaplová, et al, 2020). In fact, the lack of appropriate teacher education has been identified as a significant barrier to effective implementation of quality PE (Nathan, Elton, Babic, et al, 2018). It is surprising, then, that research into the impact of the nature and quality of teacher education interventions targeting PA is largely absent from the literature (Lander, Eather, Morgan, et al, 2017; Russ, Webster, Beets, et al, 2015).

Teacher education plays a significant role in ensuring teacher readiness with regard to delivering new programmes in schools. However, many concerns have been expressed regarding the quality and relevance of some teacher education programmes.

The quality of PETE related to school-based PA, and its impact on the nature and quality of PA interventions is largely absent from the literature (Lander, Eather, Morgan, et al, 2017; Russ, Webster, Beets, et al, 2015). However, there is some evidence from general teacher education and sports coach education that training is most effective when it integrates subject knowledge and pedagogical knowledge, supporting the development of collaborative, whole school practices (Caena, 2011; Cushion, Nelson, Armour, et al, 2010). A number of authors have suggested teacher education programmes will need to be revised in order to include the necessary skills, knowledge, and belief systems needed to prepare future teachers for Active Schools (Kwon, Kulinna, van der Mars, McMullen, et al, 2019; McMullen, Van Der Mars & Jahn, 2014). Teacher education programmes and workforce training, it has been argued, may need to modify existing courses and experiences to provide additional opportunities not only to

integrate PA throughout school, but also to develop student advocacy and skills (Kelder, Karp, Scruggs, et al, 2014). Due to the multiple responsibilities associated with the promotion of PA at school, some PE teacher education programmes have been designed to re-address this need, although evaluation has come primarily from the US. For example, the Journal of Physical Education, Recreation & Dance published a special feature that examined how different university programmes integrated Active School training into their PE courses. The university programmes that were highlighted could be considered a "reconceptualization of PE programs" with the potential to benefit all people across a lifespan (Carson, Castelli, & Kulinna, 2017, p. 49). Synthesising the reports, Castelli, Carson and Kulinna (2017) reported that despite some impressive initiatives, there was a lack of consensus in regarding the necessary skill-set for future PE teachers, and a poor evidence base of the effectiveness of different teacher training approaches. A recent survey of 25 European countries shared their PETE curricula and best practices (Hunuk, Avsar, Kupr, et al, 2019) found great variation among countries' PETE programmes, as well as a lack of coherent or systematic relationship with the wider educational systems. Some countries seemed to have little or no formal induction procedures in place for trainee PE teachers. Health concepts, in general, and Active Schools, in particular, did not appear significant features of PETE across the group of countries, as a whole. This finding was also reached by the AEHESIS (Aligning a European Higher Education Structure in Sport Science; 2014), and other European agencies concerned with the education of PE teachers (Hardman, 2011b).

11.2. Findings

Only one systematic review was found somewhat related to this theme, although it did not focus on the narrow question identified as the primary concern of this report.

Source	Country of study	Type of review	Age phase	Sample	Key findings
Dudley, Okely, Pearson, et al (2011)	Australia	Systematic	Primary & Secondary	23 articles met the inclusion criteria, published from January 1990 up to and including June 2010	Evidence was found that the most effective strategies to increase children's levels of PA and improve movement skill proficiency in primary schools was: • prioritising direct instruction • following a prescribed curriculum

					• adopting a whole-school approach to PA • providing teachers with sufficient, on-going professional development in using PE instruction methods and curriculum For secondary schools: • using a combination of prescribed PE and school sport curriculum with elements of student choice • substantial teacher professional development combined with sufficient teaching resources

Table 16: Teacher Education and Workforce

Lander, Eather, Morgan, et al (2017) investigated the type and quantity of teacher training in school-based PE PA and/or FMS interventions, and to identify what role teacher training had on the intervention outcome. Their search identified 39 articles, of which 25 measured PA (and three measured both FMS and PA). Overall, teacher education programmes for PA promotion were of more than one-day duration, provided comprehensive subject and pedagogy content, were framed by a theory or model, provided follow-up or on-going support, and were effective at improving student outcomes in PA. However, the review reported that information provided by these papers regarding the characteristics of the teacher training was largely inadequate, and consequently it was difficult to identify which teacher education characteristics were most important in relation to intervention effectiveness. The second review, by Webster, Webster, Russ, et al (2015), sought to identify recommendations for the preparation of PETE students from a public health perspective. Content analysis was used to identify 47 distinct recommendations from 25 included articles, and to synthesise these recommendations into major areas of focus. The major areas were: candidate profile (e.g., PETE students should be physically active and fit role models); candidate knowledge (e.g., PETE students should know about behaviour change theories); and candidate skills (e.g., PETE students should be able to advocate for school-based PA).

So, these reviews should be understood as providing useful background knowledge, but neither directly addressed the question of the relationship between teacher education / workforce training and student PA. Similarly, no empirical studies were identified that examined the impact of teacher education and workforce development on students' PA. This is cause for concern as the previous section highlights the need for coherent, evidence-based teacher induction in support for health-related practices in schools. There are, however, some studies that offer some insight into this issue.

A study from the US (Carson, Castelli, Kuhn, et al, 2014) involved professional training of 129 elementary and middle school PE teachers during a summer workshop, with one group (the intervention group) receiving specialist HEPA-related support based on the 'Comprehensive school physical activity program' (CSPAP). CSPAP has been proposed as a promising way for children to accumulate daily PA via five integral components: (a) PE, (b) PA during school, (c) PA before/after school, (d) staff involvement and (e) family/community engagement. So, its general approach has similarities to that discussed in this report. Students' MVPA and sedentary behaviours were assessed with accelerometery (baseline and post) in 16 schools. Results were that teachers in the intervention group reported offering significantly more PA offerings during school and activities that involve staff than before training. However, students of both intervention and control groups spent significantly less time in MVPA and significantly more time in sedentary behaviour from baseline to post assessments. These changes, especially in at-school MVPA for boys attending the intervention schools, were blunted (the decline was less severe), which the research interpreted as due to the implementation of new PA programmes in the intervention schools being largely geared toward immediately impacting the PA levels during school. There are several possible explanations for the overall disappointing findings: the professional training was of short duration; it was rather general, and lacked more differentiated strategies necessary for the different sub-groups in schools, such as girls; and the programme only ran for one year, and perhaps more time is needed for a measurable impact on PA behaviours.

Recommendations from studies examining quality teacher education related to: candidate profile (e.g., students should be physically active and fit role models); candidate knowledge (e.g., students should know about behaviour change theories); and candidate skills (e.g., students should be able to advocate for school-based physical activity).

No European studies were found that addressed this issue.

The importance of teacher education and workforce training in the professional preparation of teachers seems unarguable, but there is little evidence-based guidance for the professional development of teachers.

11.3. Conclusion

The importance of teacher education and workforce training in the professional preparation of teachers seems unarguable. Yet, despite the increased attention given to the role of schools as key settings for the promotion of HEPA, relatively little has been forwarded in terms of evidence-based guidance for either future or current teachers. The limited research discussed in this section provides little information about the effects of preparing teachers for the support and promotion of Active Schools, and is unlikely to offer the necessary support for expansion of effective Active Schools in Europe.

Sport as a Setting

12. School Sport

SUMMARY

- School sport, especially after school, has been a popular setting of PA, despite cautious support from policy-makers.
- The studies reviewed in this section suggest that sporting activities, both competitive and non-competitive, can increase both MVPA and VPA, especially if played multiple times during the week; however, attention needs to be paid to the needs of girls and overweight/obese students, who are heightened risk of exclusion.
- There have been numerous studies of the relationship between school sport, including some of high quality, and their findings are relatively consistent, leading to the rating of STRONG.

12.1. Background

The final review examines the contribution that school sport, and specifically after-school sport, makes to students' PA. After-school programmes 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 standard school day (Weaver, Beets, Huberty, et al, 2015). HEPA-based schemes seem to meet both of these criteria, and the period immediately following compulsory schooling has been proposed as an under-utilised opportunity (Beets, Weaver, Turner-McGrievy, et al, 2015).

School Sport is the structured learning that takes place beyond the curriculum (i.e. in the extended curriculum) within school settings

Whilst PE and other in-school programmes can be effective at increasing PA, discrete elements seem incapable of providing sufficient opportunities by themselves 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 behaviours have generally had little influence on PA levels (Marcus, Hirst, Kaufman, et al, 2013; Verbestel, De Henauw, Barba, et al, 2015). One review reported that PA interventions directed at children and young people have produced a small effect of approximately 4 more minutes of MVPA

per day (Metcalf, Henley, Wilkin, 2012; Tymms, Curtis, Routen, et al, 2016). After-school programmes offer a pragmatic supplement to these interventions by providing an opportunity to expand, extend, and enhance time for PA (Beets, Okley, Weaver, et al, 2016). Data about current uptake on after-school sports programmes is limited, and the available evidence suggests wide variability. For example, 43% of US youth participate in some form of after-school programme (Branscum, Sharma, Wang, et al, 2013), while over 90% of UK primary schools offer after-school programmes at least one day a week (Davies, Wood, Banfield, et al, 2014). The period after school is sometimes referred to as 'critical hours' as it is a time when young people have discretion as to how they use their own time, freed from the constraints of school and parents, and when they engage in a considerable proportion of their daily leisure time activity (Remmers, Thijs, Ettema, et al, 2019) and is predictive of overall activity patterns (Atkin, Gorely & Biddle, et al, 2011).

After-school programmes offer a pragmatic supplement to existing settings by providing an opportunity to expand, extend, and enhance time for physical activity.

Empirical research into the contribution of after-school programmes (generally not specifically targeting the increase of PA) have shown disappointing results, typically reporting that the amount of MVPA children accumulate falls well below existing recommendations (Beets, Shah. Weaver, et al, 2014; Beets, Wallner, Beighle, 2010). This has led to a growth of research into effective interventions designed to increase the levels of PA during these programmes (Dzewaltowski, Rosenkranz, Geller, et al, 2010; Herrick, Thompson, Kinder, et al, 2012; Nigg, Geller, Adams, et al, 2012). A recurring theme among these studies is that a primary barrier for successful implementation is the professional development training for PA (Beets, Weaver, Turner-McGrievy, et al, 2015). School and other staff often lack the necessary skills to create environments that are supportive of PA, and feel unable to adopt new programmes (Hastmann, Bopp, Fallon, et al, 2013).

As after-school programmes occur outside of the school day, they tend to be subject to fewer regulations, and thus function with greater flexibility, such as for time allocations, activity content, and staff qualifications.

There is no single accepted definition of what constitutes an after-school PA programme, but it is generally assumed that they include supervised activities directly after school, usually on school premises and open to all children (Demetriou, Gillison, McKenzie, 2017), although they could be based in community settings, often through collaboration between schools and community organisations. Programmes may be delivered by teachers, other school staff, community workers, sports coaches, and/or volunteers. As the programmes occur outside of the regular school day, they tend to be subject to fewer regulations, and thus function with greater flexibility (e.g., for time allocations, activity content, and staff qualifications). In contrast to PE, in which teachers' qualifications, content and other

factors are typically prescribed by law, after-school programmes are often locally designed and participation is voluntary. Sport or other forms of PA are sometimes the sole focus of these programme, but it is usually only one component of a multifaceted extracurricular programme (Demetriou, Gillison, McKenzie, 2017).

While some have questioned the direct impact of sports participation on physical activity levels, it seems that playing sports can support overall physical fitness, along with motor skills and abilities that have been shown to predict overall physical activity levels and health.

One issue that needs to be addressed is the of the word 'sport'. In countries touched by the British Empire (such as Ireland, the US, Australia, New Zealand, areas of Africa and Asia, as well as the UK countries, of course), the word has a particular meaning, namely a specific type of PA and is typically defined as "organised, usually competitive, and can be played with a team or as an individual" (Eime, Young, Harvey, et al, 2013, p. 98). This use of the term, of course, influenced the approach of the Olympic Movement. However, many European countries adopt a broader, more inclusive understanding, as is evident in the definition in the European Sports Charter (Council of Europe, 2001):

> "Sport means all forms of physical activity which, through casual or organised participation, aim at expressing or improving physical fitness and mental well-being, forming relationships or obtaining results in competitions at all levels." (Article 2)

Since the activities taking place within Active Schools are likely to go far beyond competitive games, the broader understanding of sport will be used here. And when sports are specifically competitive, that will be indicated in the text.

Competitive sports have become a topic of contention in the public health literature. Surprisingly, most national and international guidance either omits or marginalises competitive sport. The WHO, in particular, has kept a cautious distance from competitive sport in its guidance for PA (Bailey, 2018c). 'Settings' have long been at the centre of its approach (e.g. cities, workplaces, hospitals, schools), and while its goal remains the optimization of individuals' health behaviours, the approach is premised on the view that this is best achieved within people's daily cultures and routines. No sporting or other leisure settings are mentioned in the list of appropriate settings for health promotion (Skille & Solbakken, 2014). Michelini (2015) called this 'the disqualification of sport'; Berg Warner and Das (2015) describe sport as an "afterthought" (p. 20), as evidenced by the almost complete absence of the word from public health policy documentation

The concept of the Active School might be a partial solution to the exclusionary nature of certain forms of sport, with its captive audiences, and the possibility to linking sports participation with wider health-related practices.

designed to get people more physically active. Michelini argued that the source of the problem lies in a perceived incompatibility between the illness-orientated focus of health policies and the win/lose orientation of sport. According to this interpretation, sport becomes delegitimised as a potential type of healthy PA because it is performance- and not health-orientated. Many sports organisations have responded by developing health-related programmes, but critics have questioned the sustainability of these developments in a context in which there has been a significant shift in both policy rhetoric and funding from an emphasis on mass participation in PA towards elite sport (Collins, Bailey, Ford, et al, 2012). Since the amount of resources available to sport are finite, the development of elite sport has usually occurred at the expense of mass participation. This is not inevitable, but there is a tendency because "the scale of provision, the span of time needed and other favourable contextual policies to provoke major lifestyle and participation changes are huge, challenging and beyond the sport policy community, which is usually marginal" (Collins, 2008, p. 78). This situation is exacerbated by the prestige associated with elite sporting events, against which grassroots participation seems unable to compete.

Regular engagement with intermittent activities, like those involved with sports, has been associated with greater moderate-to-vigorous physical activity and cardiometabolic fitness, as well as decreased sedentary time and improved eating habits.

The concept of the Active School might be a partial solution to the exclusionary nature of certain forms of sport, with its captive audiences, and the possibility to linking sports participation with wider health-related practices. The evidence base for such claims is generally regarded as limited (Ring-Dimitriou, Krustrup, Coelho-E-Silva, et al, 2019). However, recent reviews have shown the beneficial effects of participation in sport, including competitive sport, on overall PA levels, body composition, and metabolic profile in children and young people (Bangsbo, Krustrup, Duda, et al, 2016; Milanović, Pantelić, Čović, et al, 2015). There is also evidence of a dose-response effect between the number of sports sessions per week and the quantified beneficial health outcomes (Larsen, Nielsen, Helge, et al, 2019). So, while some have questioned the direct impact of sports participation on PA levels (Bailey, 2018c), it seems that playing sports can favour a broad spectrum of development for overall physical fitness, including cardiovascular, metabolic, and musculoskeletal development, along with motor skills and abilities that have been shown to predict overall PA levels and health (Barnett, van Beurden, Morgan, et al, 2009; Milanović, Pantelić, Čović, et al, 2018). PAs that involve intermittent activity (stop-start, and varying speeds) that require movement of the whole body have been proposed as especially important for health outcomes because they mirror the natural movement patterns of children and young people (Ring-Dimitriou, Krustrup, Coelho-E-Silva, et al, 2019). These types of movements are common in competitive sports like football, basketball, as well as many forms of dance,

and unstructured PA play. Regular engagement with intermittent activities like these has been associated with greater MVPA and cardiometabolic fitness, as well as decreased sedentary time and improved eating habits (Grgic, Dumuid, Bengoechea, et al, 2018). At the least, therefore, it could be concluded that both competitive and non-competitive sports participation have the potential to play a valuable role in the promotion of HEPA.

12.2. Findings

Four reviews were identified that examined school sport as a setting for the promotion of PA. Two came from the UK (Atkin, Gorely, Biddle, et al, 2011; Mears & Jago, 2016), one from francophone Canada (Houle, Gilbert, Paiement, et al, 20207), and one from Germany / UK / US (Demetriou, Gillison, McKenzie, 2017). Three reviews used the systematic methodology, while the multinational study was a review of previously published reviews (Demetriou, Gillison, McKenzie, 2017). The Canadian review focused on girls' PA, and is included in this report because, as already discussed, the participation of female students in school sport has been highlighted as cause for concern. Table 17 summarises these documents.

Source	Country of authors	Type of review	Age phase	Sample	Key findings
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. Limitations in study design, lack of statistical power and problems with implementation have likely hindered the effectiveness of interventions in the afterschool setting to date.

[7] The article by Houle, Gilbert, Paiement, and colleagues has been published in 'medRxiv', a specialist pre-print server for the health sciences. Articles are scrutinized by editors but not yet peer reviewed. Thus, any judgements about the article's quality. It was included in this report following of ad hoc review by the author of this report.

Demetriou, Gillison, McKenzie (2017)	Germany, UK, US	Review of reviews	school-aged children or adolescents up to and including 19 years	Six existing systematic reviews and meta-analyses	In general, the reviews identified better outcomes when conducting the programmes in school rather than community settings, providing sessions on two or more days a week, and ensuring high programme attendance rates. Girls were more receptive than boys to intervention programmes that promoted weight control. Additionally, there were some benefits for increasing PA levels among overweight students, especially boys. This review of reviews suggests there is currently only modest support of the benefits of after-school programmes on child and adolescent PA levels and body composition.
Houle, Gilbert, Paiement, et al (2020)	Canada	Systematic review	Adolescent girls aged 11 to 17	Seventeen quantitative and qualitative studies describing 10 different PA programmes	The PA programmes assessed did not lead to clear improvements in PA levels or other physical outcomes. Concerning psychosocial results, there is some evidence that the programmes could improve dimensions of the self-esteem construct.
Mears & Jago (2016)	UK	Systematic review	5-18 year olds	15 articles; six studies were eligible for meta-analysis	The 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. There was a lack of convincing evidence that interventions based on theories of behaviour change were more effective than those with no underlying theory.

Table 17: Systematic Reviews – School Sport

Despite the hesitant conclusion of the reviews, many of the empirical studies reported that participation in after-school sport programmes was associated with increased levels of PA. However, there is wide variation in methods used and outcomes measured in the studies in this theme, and confidence in some of these findings is undermined by the use of research methods that might be inappropriate with children, such as self-report measures (De Meester, Aelterman, Cardon, et al, 2014; Jekauc, Reimers, Wagner, et al, 2013; Sacheck, Nelson, Ficker, et al, 2011; Vella, Cliff, Okely, et al, 2013). Consequently, there has been an increasing tendency towards the use of objective measures of activity, such as accelerometers and direct observation. Nielsen, Bugge, & Andersen (2016) used accelerometry over a 4-day period with 518 Danish 9-to-10-year olds, and found that those playing organised football had higher total daily amounts of PA than both children taking part in other organised sports and children not taking part in sports at all. It was also found that one of the most significant factors in the long-term success of out-of-school PA was how well it can be transferred to and played in other daily contexts for children's self-organised PA, such as school recess. Similar findings were reported by Machado-Rodrigues, Coelho-e-Silva, Mota, and colleagues (2012) in their study of 13- to16-year-old Portuguese boys. Sports players accrued 114 minutes per weekday of MVPA, and an average of 97 minutes per day across the week. The researchers calculated that this equated to between 11% to 13% of total daily energy expenditure in organised sports which corresponds to 35% to 42% of the MVPA of daily energy expenditure. Data from 9- to 15-year-old footballers from France, Greece and England showed average daily MVPA to be

In one study, participation in organised sports corresponded to between 35% and 42% of the moderate-to-vigorous physical activity of daily energy expenditure.

122 minutes per day, and daily VPA to be 25 minutes per day (Van Hoye, Fenton, Krommidas, et al, 2013). These studies have also found the amounts of MVPA accrued during sport participation did not occur during non-playing days and was generally replaced with low-intensity and sedentary activities, suggesting that sport might have the potential to increase levels of PA, and also be effective in reducing bouts of inactivity or sedentary behaviour (Kanters, McKenzie, Edwards, et al, 2016).

Many empirical studies reported that participation in after-school sport programmes was associated with increased levels of physical activity.

Observational studies suggest school sport can contribute substantial amounts of MVPA. For example, Peralta, O'Connor, Cotton, et al (2014) used the popular SOFIT Observation System with a group of Indigenous Australian adolescents. They found that these students were engaged in MVPA for 58% of session time. Bocarro, Kanters, Edwards et al (2014) used a different observation method to examine which school sports engage students in more PA. The researchers found that school-based sport sessions generated more PA than organised competitions, both within schools, and between schools, with boys more active during within-school competitions than in between-school competitions.

Different groups tend to be more active than others during school sport: boys are more active than girls; younger players more than older; footballers more than softball/baseball players; and normal weight students more than their overweight peers.

Researchers have investigated levels of PA during sport time specifically to determine the extent to which participation contributes to meeting targets for MVPA and VPA. A study of female netball, basketball and football participants (aged 11 to 17 years) found that for every hour of game play or practice time, participants accumulated approximately one third of the recommended 60 minutes of MVPA per day (Guagliano, Rosenkranz and Kolt, 2013). Another study found that both girls and boys (aged 7 to 14 years) engaged in approximately 45 minutes of MVPA, and 20 minutes of VPA during youth sport practice (Leek, Carlson, Cain, et al, 2011). The findings also showed that 23% of players met the recommended 60 minutes of MVPA per day during youth sport time. More encouraging findings were reported by a study of after-school football with English, French and Greek 9- to 16-year olds (Fenton, Duda, & Barrett, et al, 2015). Football sessions contributed 60.27% and 70.68% toward daily weekend MVPA and VPA, respectively. Overall, 36.70% of participants accumulated more than 60 minutes MVPA and 69.70% accrued more than 20 minutes of VPA. For participants aged 13 to 16 years, MVPA and VPA were significantly higher during football sessions, and contributed a greater amount toward daily weekend MVPA and VPA than for participants aged 9–12 years.

More negatively, 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 playing sport engaged in activity either inactive or minimally active (e.g., Leek, Carlson, Cain, et al, 2011; Van Hoye, Fenton, Krommidas, et al, 2013). Obese children and adolescents tend to be less active than their normal-weight peers during sport (Sacheck, Nelson, Ficker, et al, 2011), and girls engage in higher levels of MVPA during training sessions compared to competition (Guagliano, Rosenkranz & Kolt, 2013). 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 (Harwood, Keegan, Smith, et al, 2015). Also, teachers, coaches and other adults often base lessons on technical development and competition preparation, which are usually at sub-MVPA levels (Sasaki, Howe, John, et al, 2016).

Students can spend a large amount of time in school sport being sedentary. Some are either inactive or minimally active for up to 70% of the time.

As has been discussed earlier, the efficacy of PA is usually described in relation to intensity, duration, frequency, and type, and it seems clear that different sports offer difference levels of exercise for different players. For example, Leek and colleagues' (2011) study reported levels of MVPA and the proportion of session time engaged in MVPA to be higher in football participants, compared to softball/baseball. Other studies found that younger participants in sport sessions engage in higher levels of MVPA than older participants (Leek, Carlson, Cain, et al, 2011), boys tend to have higher levels of MVPA than girls (Hebert, Møller, Andersen, et al, 2015; Jekauc, Reimers, Wagner, et al, 2013), overweight and obese participants engage in lower levels of MVPA and VPA, and are inactive for more time, than their normal weight peers (Sacheck, Nelson, Ficker, et al, 2011), and those with access to designated sports facilities (Mandic, García Bengoechea, Stevens, et al, et al, 2012).

12.3. Conclusion

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

School-based clubs and programmes have many of the advantages of other elements of Active Schools, such as appropriate facilities, a safe and familiar environment, a captive population, often the involvement of qualified teachers. However, since they are voluntary, these activities tend to be less

good at reaching the hardest to reach groups of students. Specially designed interventions have been shown to be effective in such cases, such as girls and the overweight / obese. The evidence discussed in this section, therefore, show potential 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 sport clubs and programmes are of fundamental importance in determining any effects they have on students.

School sport can make a potentially valuable contribution, but it is unlikely to meet the daily physical activity recommendations of one hour per day for most students. A lot depends on the activities undertaken during sessions.

Transversal Categories

Transversal categories are understood to be themes that cut across of the settings and elements that provide the HEPAS framework. These themes feed into and are relevant to each of the settings. What follows are summaries of these categories as they related to the reviews above, with specific examples from the literature to highlight their application within HEPAS.

13. Inclusion and Diversity

There is a global movement towards inclusion, and every European nation affirms the right to education for all students, regardless of gender, ability, ethnicity or other factors (Flecha & Soler, 2013; Majoko, 2013; Pantic & Florian, 2015). Inclusion, therefore, is an expectation in sport and PA, as it is in any other area of the school curriculum (Heck & Block, 2019; Qi & Ha, 2012). However, there are certain challenges to overcome, such as the diverse ways in which inclusion in conceptualised by theorists and practitioners, the organisational and pedagogical demands implicit in meeting the needs of increasingly diverse school populations, and reconciling competing demands (e.g., high stakes assessments and parental expectations) with requirements to engage all learners in a meaningful and equitable way. Some writers have argued that PA settings present additional issues. One of the perennial discussions in the PA, sport and PE literatures concerns the ways in which professionals can meet the public health demand for engagement in HEPA by all children and young people and what some have suggested is the inherent exclusivity of many forms of these activities (Bailey & Callary, in press). Competitive team sports, in particular, have been identified as sites where many find themselves marginalised due to their gender, body shape, or ability (Baloun & Válková, 2017).). In response, advocates for inclusive approaches have become progressively more vocal and active, offering visions of PA that promote its virtues, without succumbing to its vices. There has also been the emergence of a growing body of guidance literature on inclusive or adapted approaches to PA and sport that shift the emphasis away from an ethos of competition and normative judgements about the body and performance, and towards an ethos of participation, individualised learning, and development (Bailey, 2010; Hofmann, Diketmüller, Koenen, et al, 2017).

There is a growing body of guidance literature on inclusive or adapted approaches to physical activity and sport that shifts the emphasis away from an ethos of competition and normative judgements about the body and performance, and towards an ethos of participation, individualised learning, and development.

As the trend towards inclusion increases, numerous studies have been conducted on the implementation of inclusive practices in PA settings (Ješina, 2011). Research into the inclusion of

persons with disabilities has been, perhaps, the area most directly related to empirical studies of inclusion (Qi & Ha, 2012), although valuable work has also been carried out related to gender (Baños, Suárez, Moreno, et al, 2016), ethnicity (Dagkas, Benn & Jawad, 2011), and sexualities (Drury, Stride, Flintoff, et al, 2017). With a lack of space, this brief discussion will focus on disability, which is estimated to affect about one in seven school students globally (Kamberidou, Bonias & Patsantaras, 2019).

Broadly speaking, research can be categorised into two themes: on inclusive education from a whole-school perspective, and research on aspects or components of inclusive education (Artiles, Kozleski, Dorn, et al, 2006). Block and Vogler's (1994) early study focused on assessing the appropriateness of inclusion of students with mild disabilities. Their findings were based on a limited number of studies (10), but results were favourable towards inclusion. None of the studies provided conclusive evidence for the efficacy or appropriateness of including all students with disabilities into regular programmes. Block and Obrusnikova (2007) conducted a more recent literature review based on 38 English-language research articles. They organised the selected studies into six focus areas: support; effects on peers without disabilities; attitudes and intentions of children without disabilities; social interactions; academic learning time-PE (ALT-PE) of students with disabilities; and training and attitudes of PE teachers. The findings of Block and Obrusnikova indicated that students with disabilities can be successfully included in PE when given proper support; moreover, such inclusion does not have any negative effects on students without disabilities.

A recurring theme of research has been the importance of appropriate professional development of teachers to support inclusive practices in physical activity.

A recurring theme of the studies reviewed in this report has been the importance of appropriate professional development of teachers to support inclusive practices in PA (Arbour-Nicitopoulos, 2018; Ješina, Miklánková, Vyhlídal, et al, 2013). It has been suggested that teachers need to develop certain core attitudes and values that underpin successful inclusive practice, and consequently ought to feature in PETE and professional development training, such as: valuing diversity and the different abilities brought to school by all students (Reina & Alvaro-Ruiz, 2016); offering a wide range of opportunities and experiences suitable for different abilities (Block, Taliaferro, Campbell, et al, 2011); and developing supportive social environments for learning and participation (Prieto, Haegele & Columna, 2020).

14. Continuous Professional Development

As already discussed, a central principle of the implementation of PA in schools is teacher training and professional development. In fact, evidence shows that the first step towards any educational change is professional development (Guskey, 2002). There are only few mentions of training or coaching in the

considered studies, and none relate directly to the implementation of the Active School concept. De Silva-Sanigorski, Bell, Kremer, et al (2012) report a training for care providers and teachers in fundamental movement skills in Australia. In Finland, schools can get support from trained mentors when it comes to implementation projects (McMullen, Ni Chroinin, Tammelin, et al., 2015). Similar findings have emerged from across the globe (e.g., Adamowitsch, Gugglberger & Dür, 2017; Beaudoin, Turcotte, Berrigan, et al, 2018), suggesting that continuous professional development is a necessary condition of successful implementation of PA programmes (Carson, Castelli, Beighle, et al, 2014).

Less information is available regarding the effectiveness of different training approaches, although research from Germany suggests that top-down interventions are often not sustainable. Ptack, Strobl, Töpfer, et al (2019) propose a participatory planning process in which various stakeholders (including PE teachers, students, and researchers) design and implement health measures. Their results confirm previous findings on the importance of teachers' role for students' learning and show the potential of participatory approaches in school settings.

There is some evidence that non-specialists (Lerum, Bartholomew, McKay, et al, 2019) and even specialist PE teachers (Alfrey, Webb & Cale, 2012) often feel unprepared for a role promoting PA within an Active School context. For some teachers, covering the PE curriculum is an achievement (Hodges, Kulinna, Lee, et al, 2017). So, there may be a need not to approach this issue too strongly, as dramatic changes to practice are complicated and can disorientate teachers, students, and parents (Ward & O'Sullivan, 2006). Despite the tendency to focus on content (Active Recess, Active Breaks, and so on), sustainable change may be better served by beginning the process with opportunities for reflection on existing practices, affirm their existing good practices, and laying the foundations for change (Ward & O'Sullivan, 2006). A qualitative project based in New Zealand and Australia (Till, Ferkins & Handcock, 2011) investigated teacher's perceptions of PA-related professional development. The teachers recognised their role in the promotion of PA opportunities for their students, and valued first-hand experience, especially where they were able to work alongside their colleagues. Observation of positive outcomes is a vital element of change, so it seems that introduction of the Active School concept in practice is best done in small steps.

It has been proposed that there are four principles of teacher change:

1. Quality professional development experiences;
2. Teachers attempting to implement the new ideas and practices;
3. Teachers observing positive student outcomes;
4. Follow-up and support.

Guskey's Model of Teacher Change (2002) presents four governing principles that crystalize this process:

1. Quality professional development experiences;
2. Teachers attempting to implement the new ideas and practices;
3. Teachers observing positive student outcomes;
4. Follow-up and support.

This model has been used in at least one empirical study in a PA setting (Hodges, Kulinna, Lee, et al, 2017), with positive results, and seems deserving of further exploration in connection with the development of teachers within Active Schools.

Non-specialists, and even specialist PE teachers, can feel unprepared for a role in physical activity promotion.

15. Facilities, Equipment and Resources

An important part of the rationale for Active Schools is that they house facilities and other resources that are supportive of increased PA (Kohl & Cook, 2013; McKenzie, Sallis, Rosengard, et al, 2016; Slingerland & Borghouts, 2011). A number of studies cited in the reviews discuss the importance of access to appropriate facilities in the promotion of PA. The inclusion of space and facilities in areas used for breaks between lessons has been found to be a significant factor in the realisation of Active Recess (Hyndman, 2017; Haug, Torsheim, Sallis, et al, 2010; Nielsen, Bugge, Hermansen, et al, 2012). For example, a study from Finland found that adding sports equipment and facilities led to an increase in the overall PA in secondary schools, and gender-specific facilities particularly affected girls' PA positively (Haapala, Hirvensalo, Laine, et al, 2014). This is consistent with other research suggesting that boys benefit most from undifferentiated playground spaces (Klinker, Schipperijn, Christian, et al, 2014). In addition, a number of studies have reported that simply adding playground markings can increase students' PA (Baquet, Aucouturier, Gamelin, et al, 2018; Blaes, Ridgers, Aucouturier, et al, 2013; Parrish, Okely, Stanley, et al, 2013). A Dutch study, for example, demonstrated the value of marking-out playgrounds with lines designed for different PA games, and teaching students how to play each game (Bartelink, et al., 2018). Adamowitsch, et al.'s (2017) Austrian project explored extending PA opportunities by extending the space available to students. The researchers suggested seeking out extra spaces from areas nearby the school, creating not just more space to move and play,

A supportive strategy for physical activity is the provision of age-appropriate sports and play equipment for each class that is made freely available to students during recess. lunchtimes, and (depending on school regulations) before and after school.

but also age-specific PA environments. In all of these initiatives, maintaining safe, social, and active environments in school is fundamental (Gleddie & Hobin, 2011).

Another strategy that has proven to be supportive of PA is the provision of age-appropriate sports and play equipment for each class that is made freely available to students during recess, lunchtimes, and (depending on school regulations) before and after school (Adamowitsch, Gugglberger & Dür, 2017; Bartelink, et al., 2018; De Silva-Sanigorski, Bell, Kremeet, et al, 2012). Most of the literature focuses on school-based facilities. However, with the addition of the concept of Active Homework, engagement with such facilities stretches out into the local environment (Williams & Hannon, 2013).

Overall, then, the available evidence supports the role of facilities, equipment and resources as mediators of PA at and around schools. Absence of facilities and equipment are a recognised barrier to participation, and budget cuts have hindered school systems from building new facilities or upgrading existing ones in many countries, especially during periods of austerity (Parnell, May, Widdop, et al, 2019). Schools and regional agencies have responded to the issues of facility and space limitations in a number of ways, such developing partnerships and contractual agreements with local community providers or universities to use their facilities for sports programmes (2012), or public-private partnerships with external businesses (Smith, 2015). A lack of funding for sports equipment has further reduced the number of participating students, and percentage of students participating in interscholastic sports is contingent on the type and number of facilities.

Maintaining safe, social, and active environments in school is fundamental.

Figure 8, drawn from the data from the study by Colabianchi, Johnston, & O'Malley (2012), shows that the percentage of students participating in after-school sport is contingent on the type and number of facilities.

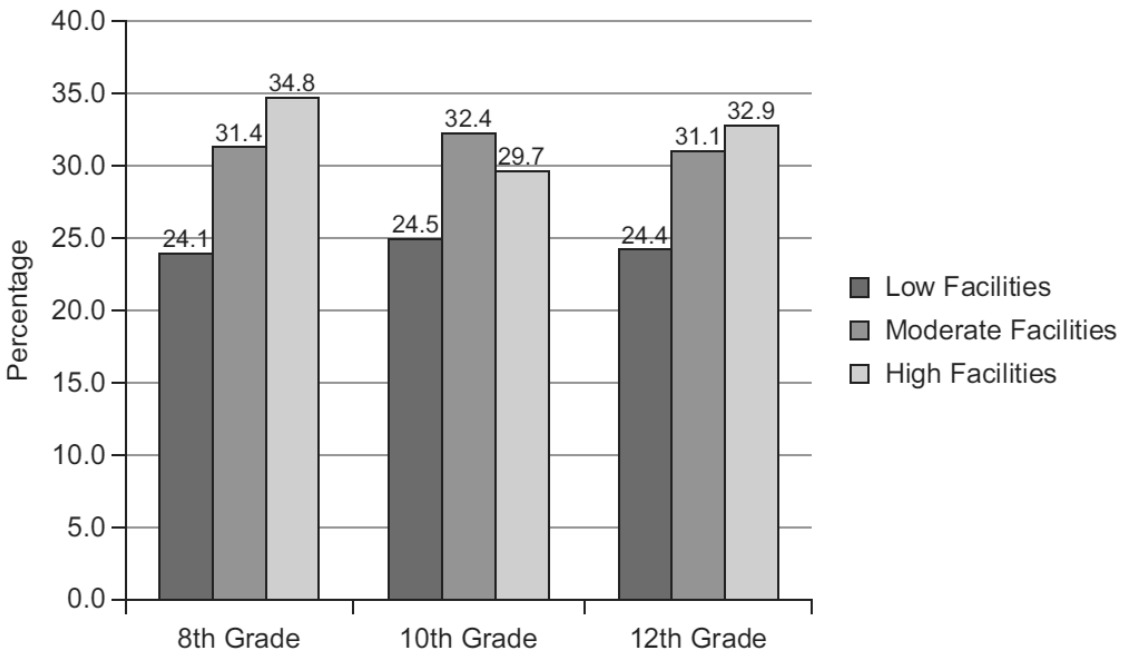


Figure 8: Participation in interscholastic sports among girls and boys by availability of sports facilities (source: Colabianchi, Johnston, & O'Malley, 2012)

Two notes of caution need to be sounded. First, from the limited scientific evidence available, as well as substantial anecdotal evidence, many school facilities are either unattractive or unsafe, and this can reduce their value within the context of the Active School (Herranz, Arribas & Pastor, 2019). Second, it should be noted that none of the studies in the reviews in this report measured the direct impact of facilities on students' PA (which is understandable as this was not one of the areas identified for review). In fact, no empirical studies within the 2010-2020 timeframe were found with this focus, and the only study specifically evaluating the effect of new facilities dates back to 2005 (Bailey, Wellard & Dismore, 2005). This study researched the effects of the building of new sports facilities in English primary schools, and found no measurable differences in students' PA levels or sports participation following the opening of the new facilities. The authors suggested that this outcome was probably due to the fact that capital investment was supported by neither the professional development of teachers nor changes to schools' curricula and timetables. In addition, since schools receiving funding for these buildings were expected to cover the costs of maintaining them, the new facilities sometimes led to additional financial pressures. This, in turn, led to reduced access to the new facilities by students, as schools were forced to generate income from non-school clubs and non-sporting activities.

This suggests that adequate facilities and equipment are necessary elements in an affect Active School programme, and their absence can turn children and young people off sport and PA. However, simply

adding facilities and equipment to the school environment is unlikely to have a significant and sustainable impact. Professional development and a modification of the priorities within the school curriculum are also necessary.

16. Community Partnerships

The importance of families and the communities in which children and young people live for educational development is well-established (Bouchard, Gallagher & St-Cyr Tribble, 2015). Their roles in the specific context of the nurturing of physically active lifestyles has received less attention from researchers, although available evidence supports the claim that family and the community involvement are necessary conditions of sustainable PA-based strategies (Chen & Gu, 2018; Cipriani, Richardson & Roberts, 2012). By observing the behaviours and lifestyles of those in their families and communities, children and young people can begin to familiarise themselves with and develop healthy habits, although the efficacy of this process is dependent on the extent to which health messages are shared between the triad of school-family-community (Epstein, 2018).

The importance of families and the communities in which children and young people live for educational development is well-established.

Epstein's (2011; see also Egan & Miller, 2019) influential framework was based on empirical studies at both primary and secondary levels, and although its interest was general education, her six types of parent / community involvement seem relevant to the Active School concept: parenting, communicating, volunteering, learning at home, decision making, and collaborating with the community (see Table 18). These categories offer some insights into possible ways in which Active Schools can work more closely with parents and the wider community.

There are six types of parent / community involvement seem relevant to the Active School concept:

- parenting;
- communicating;
- volunteering;
- learning at home;
- decision making;
- collaborating with the community.

Type of Involvement	Examples related to Active Schools
Parenting: family practices and home environments support 'children as students', and when schools understand their children's families	• Offer regular parent education workshops on the importance of healthy and active lifestyles • Provide family PA events • Share students' PA targets with parents, and engage them in supporting their achievement
Communicating: teachers**,** students, and families design effective forms of school-to-home and home-to-school communications	• Keep parents informed of Active Schools events and information via regular mailings, social media, or community apps (e.g., Class Dojo; www.classdojo.com) • Hold regular meetings focusing on the Active School • Survey parents' and community members' PA interests and patterns
Volunteering: teachers, students, and families recruit and organise help and support, and count parents as an audience for student activities	• Invite parents and members of the local community to support PE, Active Recess, and other PA opportunities at school • Plan after-school School Sport activities with community volunteers • Host EQF-accredited sports coaching courses parents and other community stakeholders to increase the school's capacity for school sport
Learning at Home: information, ideas, or training are provided to educate families about how they can help students with homework and other curriculum-related activities, decisions, and planning	• Assign Active Homework • Plan homework tasks that require students gathering PA-related information for family members • Share information about local PA settings and resources with families
Decision Making: include parents in school decisions and develop parent leaders and representatives	• Routinely survey parents and the community about PA 'wants and needs' (interests and priorities) • Include parents and other stakeholders on Active School committees • Work with parent and community associations to support PA promotion

Collaborating with the Community: community services, resources, and partners are integrated into the educational process to strengthen school programmes and student learning and development	• Carry out mapping exercises to identify local organizations and groups promoting PA • Form partnerships with community groups • Establish joint-user agreements to increase the availability of facilities

Table 18: Types of Parent and Community Involvement Applied to the Active School Concept

Evidence in favour of close and sustained partnerships between schools and the local community is convincing (Epstein, 2018), and there is no doubt that the effective delivery of partnerships is fundamental to the Active School concept (Allar, Elliott, Jones, et al, 2017; Egan & Miller, 2019). For reasons discussed in this report, students are much more likely to reach the WHO target of one hour of MVPA & VPA per day if they are supported in being active both in and outside of school.

17. School Events, Project Weeks and Camps

School events, project weeks, camps and other special, organised events are quite widely used in European schools (e.g., Böcker, 2014), although details regarding where and how they are used is not known. Summer camps are the most-researched context, due to their popularity in the United States (Wahl-Alexander & Morehead, 2017). These camps (which can be either 'day camps', in which children and young people take part during the day, but return home in the evening, or 'residential camps', where they sleep at the camp) present a promising setting to increase PA given their available time and access to children. Also, summer camps operate during the long vacation (up to 3 months) when other organised PA opportunities may be fewer, and children are unable to take advantage of more regular PA opportunities (e.g., Active Transport, PE, and school sport) (Brazendale, Beets, Weaver, et al, 2017). This is particularly important as research shows that students' summer vacation is increased weight gain (Moreno, Johnston, Woehler, 2013) and reduced fitness (Weaver, Beets, Brazendale, et al, 2018).

Summer Camps, during the long vacation (up to 3 months) when other organised physical activities opportunities may be fewer, present a promising setting to increase physical activity given their available time and access to children.

The 'structured days hypothesis' (Brazendale, Beets, Weaver, et al, 2017) suggests that health-related behaviours (PA, sedentariness, diet) are more beneficially regulated during relatively structured days (e.g., school days; residential camps) than during less structured days (e.g., long holidays; weekends). Evidence supports this hypothesis, indicating that children and young people, especially the less active (Fairclough, Boddy, Mackintosh, et al, 2015), are more active when their days are timetabled to some extent. Interestingly, recent the COVID-19 outbreak presented an unfortunate opportunity to test the structured days hypothesis, as children and their families suddenly found themselves robbed of the normal frameworks of school and work. Consistent with the hypothesis, research suggests that quarantine procedures have resulted in reduced levels of PA (Hall, Laddu, Phillips, et al, 2020; Lippi, Henry & Sanchis-Gomar, 2020; Tison, Avram, Kuhar, et al, 2020). In addition, studies of earlier disasters have taught reported

a lasting significant decrease in PA in children and adolescents over three years following the disaster (Okazaki, Suzuki, Sakamoto, et al, 2015).

Children are more active when their days are timetabled to some extent, such as during camps and other school-related events.

Surprisingly few studies have measured the impact of camps on general, school-aged participants' PA levels, although there have been useful studies with specific sub-groups, including over-weight/obese children (Brazendale, Beets, Weaver, et al, 2017), girls (Guagliano, Updyke, Rodichev, et al, 2017), and students with special needs (Schenkelberg, et al, 2015). The available evidence is that camps can be effective in the promotion of PA acquired, helping participant to meet the recommended levels of MVPA (Barrett, Cradock, Gortmaker, et al, 2014; Emm-Collison, Lewis, Reid, et al, 2019). The situation seems particularly promising for primary-aged students, especially girls (McConnon, Morgan, Van Goodwin, et al, 2017; Weaver, Brazendale, Chandler, et al, 2017). The highest quality study of the summer camp context (Brazendale, Beets, Weaver, et al, 2017) assessed the PA of more than 1,000 children (mean age – 7.8 years) enrolled on 20 North American camps. Across the 20 camps, both boys and girls accumulated a median of more than 80 minutes per day of MVPA. 80% of boys and 75% of girls met the 60-minute MVPA target, which indicates that these camps can be valuable settings for maintaining or even increasing students' daily PA levels.

There is much less published evidence related to school events and project weeks. One exception is from Germany (Böcker, 2014). This study explored the potential of whole day projects and project weeks focusing on exercise, play and sport. The findings are encouraging, although preliminary. Böcker discusses the timing, duration and organizational forms of project weeks, their contents and topics, and in particular about the importance of movement in the project week. This is an area deserving further examination.

18. Conclusion

Concerns about low levels of PA among children have been noted in the introduction to this report. Practitioners and policy makers have searched for appropriate setting for the promotion of PA, and many authorities have identified school as providing a unique opportunity to reach vast numbers of young people (Institute of Medicine, 2013; UNESCO, 2015), as most children attend school from the ages of 5 to 17 years, for 180 days per year and for 6 or more hours per day (Peterson & Fox, 2007). The school has the most continuous and intensive contact with children than any other institution in the first 20 years of their lives (Story et al., 2006). Along with spending a significant amount of their waking hours at school (Dobbins, Husson, DeCorby, et al, 2013), the school environment has also been shown to bridge socioeconomic gaps, as children from all backgrounds attend school (Naylor, Nettlefold, Race, et al, 2015). As a relatively inclusive setting, schools can help challenge the stigmatisation of overweight or obese children (Dobbins, Husson, DeCorby, et al, 2013). For these reasons, the school has been identified as an unparalleled setting to promote children's PA. In addition to providing youth with the skills, knowledge, attitudes, and values necessary for pursuing an active lifestyle across the lifespan, a key aspect of quality PE programming is engaging students in MVPA during lesson time (Carson, Castelli, Kuhn, et al, 2014).

The Active School concept is premised on the importance of increasing opportunities for students to be engaged in health-enhancing physical activity.

Much of the literature cited in support of Active Schools is premised on the importance of increasing opportunities for school students to be engaged in HEPA. The pandemic of physical inactivity gives plenty of justification for this aim. Children and young people are less active than in the past, and less active than is considered necessary for the maintenance of good health. They also have fewer opportunities to be active at home and during their free time. This situation can lead to harmful consequences for their quality of life, both during youth and later in life. Schools, as the only places where (nearly) all children and young people gather, seems a unique setting for addressing this problem. In fact, many writers have implicitly maintained that schools should aspire to support their students achieving the one-hour-a-day target of the WHO for HEPA at school (e.g., Fröberg, Raustorp, Pagels, et al., 2017; Frömel, Svozil, Chmelík, et al, 2016; Martin, Kelly, Boyle, et al, 2016; Sallis, Bull, Guthold, et al, 2016). PA associated with other contexts, such as external sports and dance clubs, local parks and streets would, therefore, supplement the

Schools offer unparalleled settings to promote physical activity. In addition to providing youth with the skills, knowledge, attitudes, and values necessary for pursuing an active lifestyle, a key aspect of quality physical education programming is engaging students in moderate-to-vigorous physical activity.

daily foundation of PE provided by schools. Since one-hour-a-day does not represent a threshold for good health, but just a minimum expectation, focusing on PA at schools makes sense. There appears to be a dose response relationship between PA and health benefits, so (generally speaking) the more HEPA, the better!

Each of the settings discussed in this report have the potential to contribute time to PA, although it seems that none is likely to be able to do this alone. The beauty of the Active Schools concept is that it could be understood to capitalise on two valuable effects related to the promotion of PA:

- Participation effects: accumulating bouts of PA throughout the school day contributes to students' health, from relatively brief and LPA bursts from active learning to longer periods, including MVPA and VPA, in PE and school sport.

- Synergy effects: sustainable HEPA is built on a foundation of 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), and values (e.g. believing HEPA is important). The multifactorial nature of Active Schools offers a holistic presentation of these competencies such that, when done well, the whole is greater than the sum of its parts.

To illustrate the difference changes to PA during the school day can make, consider Figure 9. Each column represents Data from international and large-scale studies: the "typical day (no PE)" represents an average amount of different forms of PA associated with school when there is no PE lesson timetabled; the "typical day (PE)" represents the same data but with the addition of a PE lesson; and the "Enhanced day (PE)" summarises findings of intervention studies and best practice examples.

Active Schools capitalise on two valuable effects related to the promotion of physical activity:

- participation effects - accumulating bouts of physical activity contribute to students' health;
- synergy effects – sustainable physical activity benefits from a holistic approach.

Active Schools are well-placed to support both of these effects.

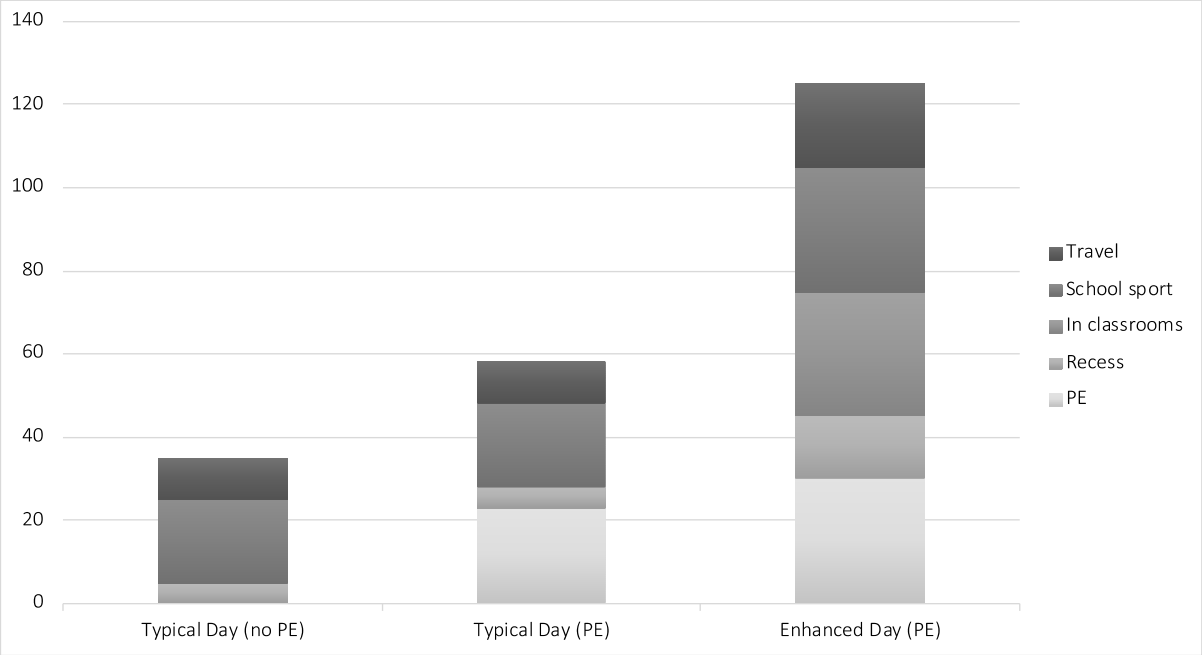


Figure 9: PA at school in three scenarios (based on data from Bassett et al., 2013; Beets, Okely, Weaver, et al, 2016; Kohl & Cook, 2013)

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. Lowest long PA is unlikely to result from merely large amounts of PA during childhood. Positive emotions are integral features of sustainable, voluntary participation in any activity (Milton, 2002), creating a drive to repeat and extend those positive experiences in the future. Motivational psychology provides more detail, here, including evidence of the importance of intrinsic motivation for sustained participation:

Schools hold a great deal of potential and settings for the promotion of physical activity among its students (and staff), but it is important to acknowledge that most schools do not realise this potential.

> "an incentive to engage in a specific activity that derives from pleasure in the activity itself (e.g., a genuine interest in a subject studied) rather than because of any external benefits that might be obtained." (APA, 2020; unpaged)

Intrinsic motivation is a key construct in this topic as individuals who are intrinsically motivated to be active do so purely for the pleasure of being active. Motivation for the behaviour comes from within the individual and is the most autonomous form of motivation. Because motivation for the behaviour is not dependent on external forces, it is likely to be sustained—even when circumstances change (Kalajas-Tilga, Koka, Hein, et al, 2019). The most influential theory of motivation is self-determination theory (Ryan & Deci, 2017;

González-Cutre, Sierra, Beltrán-Carrillo, et al, 2018). The theory posits that goal directed behaviours are driven by three innate psychological needs: autonomy (the need to feel ownership of one's behaviour), competence (the need to produce desired outcomes and to experience mastery), and relatedness (the need to feel connected to others) in every human being. When the three psychological needs are satisfied in a particular context, intrinsic motivation will increase. People engage in activities that interest them with a full sense of volition, and without the presence of external rewards or constraints.

Research suggests moderate-to-vigorous physical activity levels begin to decline around the age of school entry. After 5 years of age, there is an average decrease of 4.2 % in total physical activity every year.

If it is the case, as has been suggested in this report, that schools hold a great deal of potential as settings for the promotion of HEPA among its students (and staff), it is also important to acknowledge that most schools do not realise this potential (Egan, Webster, Beets, et al, 2019; Messing, Rütten, Abu-Omar, et al, 2019; Russ, Webster, Beets, et al, 2015; Viciana, Mayorga-Vega & Martínez-Baena, 2016). For most students in Europe, school is, in fact, the most sedentary part of their day (da Costa, da Silva, George, et al, 2017; Skage & Dyrstad, 2019; Yli-Piipari, Kulmala, Jaakkola, et al, 2016).

Evidence from studies with objective measures of PA, longitudinal studies, and the International Children's Accelerometry Database (a consortium project that standardises and pools accelerometer-measured PA (http://www.mrc-epid.cam.ac.uk/research/studies/icad) suggest that MVPA begins to decline, and sedentary behaviour begins to increase, from around the age of school entry (Cooper, Goodman, Page, 2015; Farooq, Parkinson, Adamson, et al, 2018; Reilly, 2016). Predictably, boys tend to be less sedentary and more active than girls at all ages. By Reilly's (2016) analysis, after 5 years of age, there is an average decrease of 4.2 % in total PA with each additional year of age, due mainly to lower levels of LPA and greater time spent sedentary. In addition, PA differs between samples from different countries, with a 15– 20% difference between the highest and lowest countries at age 9– 10 and a 26– 28% difference at age 12– 13. Overall, these data suggest that the standard model of a school is badly suited for the promotion of PA. They are, in fact, very well-designed for the encouragement of sedentary behaviours!

Many interventions aiming to promote PA are based on either complex psychological theories of personal and social processes that mediate PA behaviours (Craggs, Corder, van Sluijs, et al, 2011; Martins, Marques, Sarmento, et al, 2015), or social-ecological models that emphasise the

Active Schools could aspire to:

- expand physical education opportunities;
- extend physical activity opportunities;
- enhancing physical activity opportunities.

influence of the environments in which children and young people spend their time (Carson, Castelli, Beighle, et al, 2014: Pigeot, Baranowski, De Henauw, et al, 2015). Practices informed by these theories have proven useful in drawing attention to barriers to PA, but they have been much less successful in charging the mediator targeted (Beets, Okely, Weaver, et al, 2016), and have generally had little impact on children and young people's PA behaviours (Verbestel, De Henauw, Barba, et al, 2015). According to one systematic review and meta-analysis, the increase in MVPA following interventions averages about four minutes per day (Metcalf, Henley & Wilkin, 2012). Some have suggested that greater attention needs to be given to practical than theoretical strategies by looking for ways to increase PA by making more time and opportunity to move. It has been argued that dominated theories from the sport sciences have rarely been formulated, explained, or tested (Jago, Edwards, Sebire, et al, 2015; Wilson, Van Horn, Kitzman-Ulrich, et al, 2011). In other words, the practical value of implementing interventions too-easily become relegated to the theoretical constructs behind them. Beets, Okely, Weaver, et al (2016) follow an alternative approach with their "Theory of expanded, extended, and enhanced opportunities for youth physical activity promotion". This is a pragmatically orientated theory to the extent that it generalises and formalises practices that are already happening in schools, but making sense of them within a theoretically rich umbrella concept. These approaches typically involve expanding PE opportunities [e.g. adding new PE time before or after school], extend PA opportunities [e.g. adding time for existing PA opportunities, such as longer recess], and/or enhancing PA opportunities [e.g. augmenting existing PA opportunities, such as providing choice within PE] to maximise the amount of PA students accumulate. This is consistent with scientific theories, such as the socio-ecological framework, but takes as its starting point the results of tests in the realities of schools. This seems the best way ahead for the Active Schools concept, too.

Active Schools should not just be framed in terms of increasing the quantity of physical activity. Equally necessary is paying attention to the enjoyment, and quality of physical activity experiences.

This perspective suggests that Active Schools should not just be framed in terms of increasing the quantity of PA. Lots of PA at school is a necessarily condition for the realisation of the Active School concept, but it is probably not enough to lay the foundations of healthy lifestyles. Equally necessary is paying attention to the enjoyment, and quality of PA experiences.

18.1. Summary

By way of summary, a model is suggested that captures the evidence and issues discussed in this report, and the relationships between them. The skeleton of the model is based on the framework presented by the HEPAS partnership, as well as published research (e.g., Daly-Smith, Quarmby, Archbold, et al, 2020). While the different elements represent an excellent account of the key aspects of activity-promoting

schools, the list is not final. Details can be added or removed as more evidence emerges, or a more clear or logical structure is proposed. This model is merely suggested as a useful starting point for discussion.

There are four key parts of the model, with some parts containing constituent elements:

1. Policy drivers
    a. External influencers
    b. Internal Influencers
2. Active School Settings
    a. Active breaks
    b. Active learning
    c. Active recess
    d. Active transport
    e. Active homework
    f. Curriculum PE lessons
    g. Teacher education / Workforce
    h. School sport
3. Transversal Categories
    a. Inclusion and diversity
    b. Continuous professional development
    c. Facilities, equipment and resources
    d. Community partnerships
    e. School events, project weeks, camps
4. School Context

The whole of an effective initiative or idea is greater than the sum of its parts: an. Active School is more than a series of activities and settings.

Each of these parts and elements can be discussed separately, but the real significance is as part of a synergistic whole. This means that the relationships between the different parts and elements might be as important as the parts and elements themselves. Since it was not a part of the remit of the reviews, the relationships between the parts of the Active School concept have not been discussed in detail. However, this would be a worthwhile activity as there is evidence that changing practices are much more likely when there is a whole school approach. And this requires shared values and priorities, underpinned by on-going communication. And shared commitments can become worthless unless they are promoted by relevantly

trained teachers and other staff, take place in appropriate facilities and spaces, and are ensured sufficient time in and out of the timetable.

Research into educational policy supports the idea that the whole of an effective initiative or concept is greater than the sum of its parts (e.g., Jie, 2016; Rizvi & Lingard, 2010). Studies of policy development have shown that policy-makers, local government officials, school leaders, and teachers, are all affected by the context within which they live and work. Context is shaped by political change or ideology, by history and culture, and the process of policy making—how issues get on to policy agendas, and how they fare once there—is affected by stakeholders, their influence, values and expectations. And, of course, the content of initiatives reflects some or all of these dimensions. Therefore, while the suggested model might be useful for helping us to systematically think about all the different factors that might affect Active Schools, it is really a map that shows the broad themes until further detail is added.

Principles/headteachers are particularly influential in forming the values and goals of the school, and are the primary factors in determining what takes place within the school, how, and why.

'Policy drivers' are the aims, targets or statements that are considered to be desirable by the various stakeholders for schools. Many of these drivers are external to the school, but their expectations shape the day-to-day activities of teachers and students. For example, all European countries have some sort of national framework for education, and this sets statutory requirements for all schools. Some countries have national curriculum which articulate detailed schemes of work and hierarchies of content, and because they are legally binding, they carry great weight among educational administrators and school leaders. Some external influences carry no legal power, but the wide scale acceptance of the guidance means that they have a "soft law". The obvious example of this within the context of this report is the guidance of the World Health Organisation, and its recommendation that every child and young person be physically active for at least one hour a day. School leaders and teachers have to struggle to meet this wide range of expectations, and usually end up prioritising some over others. So, some school curricular areas are generally considered to have a higher status than others, and unfortunately PE has traditionally been a low status subject even when it is technically equal to other subjects. This privileging of some subject areas over others reflects a range of forces, both external and internal to the school, such as history, tradition and culture, assessment regimes, national and local politics, and personal interests and backgrounds. There is no doubt that influences from within the school play a significant role in shaping and managing the different expectations

Most teachers have not received significant preparation to promote physical activity, so there is a need to ensure continuous professional development in support of the Active School.

presented to them. Principles/headteachers are particularly influential in forming the values and goals of the school, and are the primary factors in determining what takes place within the school, how, and why.

18.2. The HEPAS Active School Model

From the perspective of the Active Schools concept, it is vitally important to understand the range of forces directing educational practice. It was also important to understand how those forces can be directed towards or away from PA promotion. Numerous authors discussed in this document have suggested that whole school activity promotion requires an "activity leader" who can coordinate the various elements and activities, but, importantly, act as a central advocate for the growth of the Active School.

Within the school, a number of key stakeholders for PA can be identified. An activity leader is obviously going to play a pivotal role, and will usually be either a PE specialist, or someone who has experienced considerable professional development. Most teachers, it is known, have not received significant preparation to promote PA, and the need to ensure continuous professional development is a theme that repeatedly emerged from the literature reviews. Parents and the wider community need to be engaged, as a central concept of the Active School is the abandonment of the traditional division between in-school and out of school activities. Active Transport and Active Homework are good examples of this new approach; they would be impossible without the full support of parents, and within an activity friendly local environment. And with the growth of public and private partnerships in developing new facilities, there is likely to be a growing expectation across Europe that schools explore ways of co-funding, co-managing, and co-using facilities.

Daily physical activity assumes a great deal of cooperation and decision-making by children and young people. Early engagement of students in change towards a more active school environment is vital.

The most important people within the school are, of course, the students. Realisation of WHO will not happen if it is left solely in the hands of teachers and parents. Daily PA assumes a great deal of cooperation and decision-making by children and young people, and a number of studies in this report have highlighted the importance of early engagement of students in change towards a more active school environment. The word 'active' is interesting within this context, as it has two distinct meanings within the educational literature. The first, which will be familiar to readers of this report, relates to PA and exercise, and its opposite, 'passive', indicates sedentariness. The second sense of 'active' within educational theory indicates pro-activity, enthusiastic, and dynamic. The opposite idea, here, is 'passive' as docile, apathetic, and uninvolved. Perhaps both senses of the term 'active' should be applied to the concept of the Active School?

The different elements of the HEPAS framework have been frequently discussed in this report, and do not need repeating here. However, it is important to remember that these are not the only settings for the promotion of PA in schools, nor are they the most effective. The report has suggested that some of these elements are under-researched, and so it is difficult to make an informed judgement about their use. Active Homework is, perhaps, the best example of this. There are other settings and approaches that could be added to this list, too. For example, standing desks, bike-desks, walking buses, outside clubs for PE lessons, morning calisthenics, and many other activities might be considered and added to the list of settings.

To avoid the danger of repetition or redundancy, they would seem to be the necessity of some sort of coordinator, such as an activity leader, to ensure that the different elements work synergistically. So, the movement skills developed in PE lessons could be applied and practiced in Homework. They could also be practiced during Recess and sports clubs, especially they are planned collaboratively. Likewise, professional development will probably be needed to support Active Breaks and Active Learning, which could easy connect with PE lessons and Active Recess. In other words, whole-school PA requires whole-school planning.

The third section of the model relates to the context in which PA takes place. The importance of facilities and equipment has been discussed earlier. Despite a lack of research in this area, it seems reasonable to suggest that the absence of adequate space and play equipment will limit PA. Indeed, there is some evidence that the amount of available space (playgrounds, fields, gymnasiums) positively relates to the amount of PA taking place. There was also persuasive evidence that perceptions of the physical environment are more important than the environment itself. Dark, untidy, or badly maintained equipment or play areas reduce the likelihood of activity. Bright, colourful playgrounds are known to promote active play. Social climate refers to the non-physical aspects of PA within the school. Friendly, supportive and inclusive environments are much more likely to promote PA, especially those who are traditionally marginalised, such as girls and the overweight. Teachers and other school staff are vitally important in creating this climate, by promoting and enforcing relevant rules and norms, promoting positive peer relationships, and celebrating diversity.

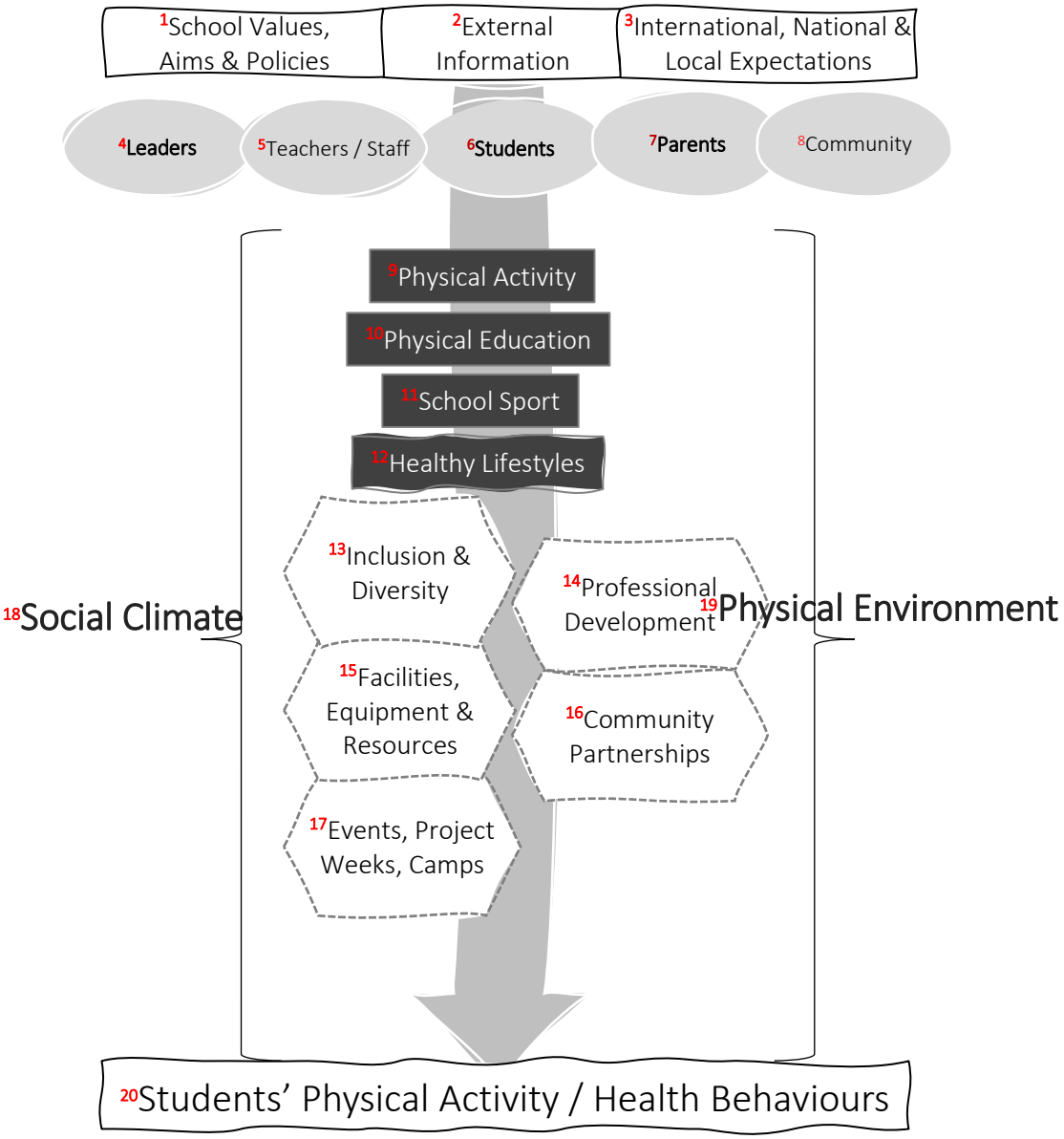


Figure 10: The HEPAS Model of an Active School

Notes on the HEPAS Active School Model

1. **School Values, Aims & Policies** often discuss aims and values regarding physical activity and health promotion, as well as more general goals. In addition to these explicitly presented aims and values, schools called implicit aims and values that are not discussed, but reflect assumptions and priorities.
2. **External Information** might include information from the scientific research, traditional and social media, and consultants and advisers.
3. **International, National & Local Expectations** ranges from international guidance, such as the WHO Physical Activity targets, to national curriculum, and municipal and local policy statements.
4. **Leaders**, such as school headteachers/principals, school governing bodies, and other leadership bodies, are known to be crucial mediators between policy and practice.
5. **Teachers / Staff** and other significant adults are responsible for the promotion of physically and healthy lifestyles of learners. In addition to teachers, this might include sports coaches, teaching assistants, and volunteers.
6. **Students' voices** in planning, delivery, and evaluation are vital elements in supporting sustainable health-related initiatives
7. **Parents** and families influence learners' engagement with healthy lifestyles, both in and outside of school.
8. **Community** refers to members of the local area, relevant service providers (such as school neighbours, sports club owners, municipal leisure stakeholders).
9. **Physical Activity**, according to the HEPAS Project, includes Active Homework, Active Learning (active lessons), Active Recess, and Active Transport (to and from school).
10. **Physical Education**, according to the HEPAS Project, includes school PE lessons and physical teacher education.
11. **School Sport**, according to the HEPAS Project, includes competitive and non-competitive activities taking place outside of the normal school day.
12. **Healthy Lifestyles**, in this context, refers to the findings of the consensus study into the most effective elements of learning and health support systems influencing school students' healthy lifestyles education.

13. **Inclusion and Diversity** refers to policies and practices that promote the participation and engagement of all learners, irrespective of dis/abilities, gender, as solicitor, or other socio-economic factors.
14. **Professional Development** refers to the formal, informal, and non-formal professional training opportunities for qualified teachers and other school staff.
15. **Facilities, Equipment & Resources** refer to any school capital structures and spaces associated with the promotion of health and physical activity, including gymnasia, play equipment, fields associated with the school, and sports equipment.
16. **Community Partnerships** include any formal or informal understandings between the school and members of the local neighbourhood. This might include, for example, sports groups, religious and community associations, and shop owners.
17. **Events, Project Weeks, Camps** are examples of extra-curricular activities that support the promotion of physical activity and healthy lifestyles, but usually take place outside of school hours and away from school premises.
18. **Social Climate** refers to characteristics of the psycho-social environment, and includes interpersonal relationships, staff-teacher relationships, peer relationships, staff beliefs and behaviours, staff communication styles, lesson and activity management and group processes.
19. **The Physical Environment** is made up of the real and perceived characteristics of the physical context in which children spend their time (e.g., home, neighbourhood, school) including aspects of urban design (e.g., presence and structure of sidewalks), traffic density and speed, distance to and design of venues for physical activity (e.g., playgrounds, parks and school yards), crime and safety.
20. **Students' Physical Activity / Health Behaviours**, in-, after-, and out-of-school, are the intended outcomes of Active Schools.

19. Recommendations

The Active School concept is a practical solution to the challenge of promoting PA among school-aged children and young people. By expanding, extending, and enhancing settings and opportunities for PA, it offers a manageable methodology for achieving the international target of at least one-hour-per-day, including periods of MVPA and VPA. Evidence suggests that the Active School concept is popular with students and teachers, causes not harm to academic achievement (and can actually enhance it), and can significantly increase the quantity and quality of PA experiences. Of course, not all students benefit from PA opportunities equally, and it is important that schools and teachers work to ensure that the PA settings do not merely result in more opportunities for those who are already active. Strategies need to be put in place to support the needs and interests of girls, overweight/obese students, and other groups who have been marginalised or excluded from PA in traditional school settings.

Physical activity settings at school

Active Breaks

- Active Breaks should be integrated as a daily and regular ritual in all classes in all school levels. They should be organized in an inclusive way in order to engage all students.
- School and supporting agencies should compile a collection of Active Break ideas, and make them available as a resource for all teachers.
- Information and guidance about Active Breaks should be shared with parents, encouraging them to implement Active Breaks at home.

Active learning

- Schools and supporting agencies should include professional development opportunities for all school staff on the importance of physical activity for learners' health and learning, and introduce accessible strategies and practices for implementing Active Learning into all lessons.
- Schools and supporting agencies should create and share working examples of how to use Active Learning in different school subjects.
- Active Learning can and should be used in all curriculum areas. Teachers need to be given sufficient professional development in order to fully realise these opportunities.

Active Recess

- Schools should ensure easy access to a variety of physical activities that can be practiced by all students during recess.
- They should give particular attention to the active engagement of girls, the disabled, and other groups that have traditionally been marginalized during recess.
- Funding should be made available, where necessary and possible, to support the development of activity-promoting school spaces, including playground markings and safe equipment / apparatus.
- Developmentally appropriate play and sports equipment (balls, bats, hoops, ropes, etc.) should be available to all students, and supervised to ensure they are used equitable and safely.

Active Homework

- Active Homework requires the support and engagement of parents, so schools should hold regular meetings, share information, and establish effective means of communication about it.
- Schools should help families identify accessible spaces and facilities for physical activity and sport, including parks, play areas, sports centres, and (if regulations allow it) school facilities.
- Schools should establish cooperative relationships with local partners involved with physical activity promotion, such as sports centres, sports and dance clubs, Scouts/Guides, cultural and religious groups, to help create extended opportunities for Active Homework.

Active Transport

- Municipalities should support active transport initiatives by establishing safe and well-lit routes to school, or places for securing students´ vehicles.
- Schools should encourage Active Transport by communicating supportive messages, sharing guidance, and possibly initiating collaborative actions, such as Walking Buses and group cycling.
- Teachers should integrate Active Transport into lessons by, for example, planning projects exploring the local environment, surveying perceptions of safety in the local area, and calculating distances, speeds and times of different routes to and from school.
- Schools should introduce, if they are not already available, cycle education programmes for students.

Physical Education as a Setting

Curriculum Physical Education

- As the only source of regular physical activity guaranteed to all children and young people, physical education lessons form the foundation of the Active School concept. Therefore, national and local statutory expectations regarding time allocation for physical education should be protected, and, where appropriate, extended.
- Schools should, where possible, develop and implement school-wide curricula in physical education, in order that all teachers aim for the objectives in physical education in a coherent way. In order to engage all students, curricula should present a broad and balanced range of inclusive activities, including developmentally appropriate movement experience, and competitive and non-competitive activities.
- Physical education in Active Schools will integrate with and promote physical activity across the school, including encouraging and teaching skills to be practised during Active Recess and Active Learning, celebrating Active Transport, supporting non- physical education teachers in their implementation of Active Breaks. They should also work with colleagues to introduce Active Homework, where appropriate.
- Physical education should be encouraged by school leaders to think of themselves as 'Activity Leaders', responsible for the promotion of active and healthy lifestyles across the school, and beyond. Adequate time and resources need to be made available for this role.

Teacher Education / Workforce

- Physical education teachers may be the only members of school of staff professionally trained to work with students in physical activity settings, although training institutions should consider how they train, prepare, and effectively equip prospective teachers for the expanded role implicit within the Active School concept.
- As teaching quality is at least as important as physical activities themselves in realising positive outcomes, school leaders should implement a range of professional development practices to improve the confidence and competence of all staff involved with teaching physical education.
- Universities and other providers of physical education teacher education need to work with schools and teachers to develop the Active Schools concept, and integrate its elements and philosophy into programmes.
- All physical education teacher education programmes, including those for generalists working in Primary Schools, should include modules preparing future teachers to take a leading role in the promotion of physical activity.

- All teacher education programmes for future Primary School teachers should include sufficient preparation for the delivery of quality and safe physical education for all students.
- Partnership between local stakeholders – schools, municipal governments, universities, private companies – should be developed in order to provide a comprehensive range of professional development opportunities for teachers, and other adults involved with health promotion.
- Access to professional development related to the Active School should be available to all staff involved with the Active School.
- National government and municipal government should identify and ring-fence funds for award-bearing courses supportive of the Active School concept, such as University-accredited programmes.

Sport as a Setting

School Sport

- Participation in both competitive and non-competitive sports and physical activities should be included and encouraged in the Active School, as a unique source of health-enhancing physical activity, skill development, socialising, and fun.
- All students should have regular opportunities to play competitive and / or non-competitive sport activities, irrespective of their gender and ability.
- School and non-school staff should receive professional training and support to help them elevate physical activity levels, maximise time active, and include all students during sport session.
- Since an after-school sport programme can be organized more flexibly and independently than within curricular regulations, it is worth examining the community connections, including those with sport clubs.

Transversal Categories

Inclusion and Diversity

- Teachers and other members of staff should promote and develop positive attitudes and values towards inclusion/value diversity, sharing experiences of successful inclusive practice, and creating a multi-professional support team of people surrounding students.
- School leaders should take responsibility for developing supportive social environments for learning and participation, such as by ensuring professional development for inclusive teaching is available to all staff,

by making available necessary material/equipment needed, and adapting the school curriculum (if possible).

- Local governments should support schools in creating a barrier-free school environment, through professional development courses, the provision of specialist support staff, and helping help with access community resources.

Continuous Professional Development

- Teachers should engage in relevant professional development experiences, including taught courses, structure observation activities, and reflecting practice.
- School leaders should support teachers to put knowledge from CPD into practice by helping them develop personal programmes of professional development, and regularly providing information about professional development opportunities.
- Local governments should support the development of programmes of professional development, and disseminate information about such activities.

Facilities, Equipment and Resources

- Teachers should become familiar with the safe and appropriate use of resources, become familiar with the resources available, and train students in the safe and appropriate use of these facilities, equipment and resources.
- School leaders explore funding sources for the improvement of playgrounds and other resources, including markings, facilities, sports equipment and other resources that are supportive of increased physical activity, whilst maintaining safe, social, and active environments in school.
- Local governments should support increased access to age-appropriate facilities in the promotion of physical activity, seek out new spaces from areas nearby the school, and make sure that facilities remain accessible, attractive and safe. Where relevant to municipalities, they should establish joint-user agreements to increase the availability of facilities.

Community Partnerships

- Teachers talk to parents, sport coaches and fellow teachers in local schools to support the development of a 'join-up' supportive and activity-friendly environment for all students. They should also assign active

homework, include physical activity-related information for family members, encourage families to discover and use local sport facilities.

- Teachers should encourage parents and other community stakeholders to take part in Active School committees, and work with parent and community associations to support physical activity promotion throughout the community.
- School leaders should keep parents regularly informed of school initiatives, and encourage them to participate actively. They should proactively collaborate with the key community stakeholders, and identify and work with local organizations and groups promoting physical activity.
- Local governments should plan after-school school sport activities with community volunteers and sports coaches and others, share information about local physical activity settings and resources with families and schools, and regularly gather information about physical activity behaviours, interests, and priorities in the community.
- Institutions of higher education, such as universities and research centres, can be key partners in the development and implementation of the Active Schools concept.

School Events, Project Weeks and Camps

- Teachers advocate for the inclusion of physical activity-orientated project weeks, day camps and residential camps within the school year.
- School leaders support teachers' initiatives by protecting budgets for these activities, and allowing time for them.
- Local government personnel develop partnerships and contractual agreements with local community providers and / or universities to use their facilities.

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