



## **The School Environment and Adolescent Physical Activity**

**An exploration of UK-based non-academic literature of interventions that promote physical activity via changes to the secondary school environment**

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## Executive summary

The Creating Active School Environments (CASE) project aims to find ways to help adolescents be more active and sit less within the school environment. This is in line with the Department of Health and Public Health England physical activity policies and the overall government goal that good schools are active promoters of their students' health.

As part of the CASE programme of research we explored the UK-based non-academic literature relating to school-based interventions and programmes that have attempted to modify the school environment (including physical, social and policy features) in order to increase physical activity and/or reduce sedentary behaviours in adolescent populations. We also conducted a small number of telephone interviews with individuals from organisations involved in implementing these sorts of initiatives.

This report is not intended as an exhaustive review of the evidence. It provides examples of interventions and programmes from across the UK that target features of the secondary school environment that do not form published journal articles. In this report we present examples of various interventions and programmes and also key recommendations for creating active school environments.

Several detailed and useful frameworks and guidance documents exist that outline how schools can promote physical activity (in addition to health and well-being overall) via changes to their wider school environment. However, there remain very few evaluations of these sorts of initiatives in secondary schools.

Most initiatives targeting the school environment have focused on extracurricular physical activity policies and PE initiatives. Making successful changes to the wider school environment involved consulting with students and allowing them to design and lead initiatives. Furthermore, changing the school culture is essential, which is done by making physical activity a priority and having the whole school involved in planning and implementation – for this, effective leadership is key. There are very limited examples of changes to the physical environment and none that have targeted classroom features (e.g., active lessons, standing desks etc.).

A lack of funding for research and complex (and tailored) interventions that are unique to each school are the key challenges to rigorous evaluation. Recommendations include more rigorous evaluations that include process evaluations (i.e., was the intervention implemented as intended) and outcomes that go beyond simply numbers of students participating in an activity to include broader outcomes such as well-being (for students and staff), attendance and attainment.

## Background to CASE

Doing more physical activity (PA) and sitting less is important for health and well-being in young people. However, many are not active for the government-recommended time of 60 minutes per day, and they also sit for long periods. This unhealthy lifestyle is partly influenced by the school environment.

The potential of the secondary school environment to improve students' PA is not well understood. The environment includes a school's physical (e.g., classroom design and outside space), social (e.g., the school's culture relating to PA, teacher behaviours) and policy (e.g. rules about PA, uniform policies) features.

The Creating Active School Environments (CASE) project (<http://www.cedar.iph.cam.ac.uk/case/>) aims to identify how the school environment might best influence young people's activity behaviour. This 3-year project, funded by the [Department of Health Policy Research Program](#), aims to increase our understanding of how secondary schools can help young people move more and sit less throughout the school day. It will help us find out what strategies would be most effective, acceptable and provide the best value for money.



The CASE project will achieve its objectives by:

- Identifying novel intervention strategies by reviewing the existing literature and analysing existing data from open access resources;
- Including students, teachers, parents/carers, commissioners and other experts in prioritising promising interventions;
- Testing the acceptability and feasibility of 2 interventions. This will involve implementing an intervention and examining user experiences as well as activity and academic-related outcomes (including class behaviour and concentration).

This work will identify new ways in which schools can promote health across the school day and environment (beyond PE). This could result in positive changes in activity, well-being, academic engagement, and broader social development in large groups of adolescents.

As part of the CASE project, we have conducted an extensive review of the published evidence focusing on the school environment and adolescent PA and sedentary behaviour (Morton et al; forthcoming in *Obesity Reviews*). However, the inclusion of non-academic ('grey') literature within the CASE project is essential for minimizing the potential effects of publication bias, as published studies alone cannot be assumed to be an accurate representation of the whole evidence base.

## **Objectives of the current report**

This report will provide substantial additional information to the systematic review of published studies (see Morton et al., in press, *Obesity Reviews*), enabling us to identify a broader range of intervention possibilities potentially suitable for implementation in UK secondary schools.

This report is not intended as an exhaustive review of the non-academic evidence. It provides examples of interventions and programmes from across the UK that target features of the school environment. It aims to give examples and provide recommendations to guide and facilitate our CASE research programme.

## **Methods**

1. A list of relevant 'experts' was created with help from the CASE strategic advisory group. This included academics who publish in this field, along with UK-based charities and local authorities who could provide information on any interventions or programmes that have been implemented.
2. Webpages relating to the aforementioned list of experts were reviewed in order to source any publically available reports/documents.
3. Experts were contacted by email to ask if they had additional evaluations or reports (including ones that are not publically available online) relating to relevant programmes (see the *inclusion criteria* below) and asked to send any relevant reports to the CASE research team.
4. A snowball sampling strategy was utilised whereby individuals who were contacted were asked to highlight any other individuals or groups who might be able to inform us about relevant school environment-focused interventions or programmes that have occurred in the UK.

### ***Inclusion criteria***

The documents and reports must:

- Outline intervention(s)/programme(s) that focus on the secondary school environment (physical, social and/or policy environment)
- Outline intervention(s)/programme(s) that focus on adolescent PA or sedentary behaviour.
- Include examples from UK secondary school(s)
- Report received between March-June 2015 (could be published at any date).

### ***Relevant reports and documents sourced***

In total, 24 documents /reports were sent to the CASE research team. Following a process of screening these based on the inclusion criteria outlined above, 10 reports were included in the current report:

- Designed to Move: Active Schools, British Heart Foundation National Centre and Nike, 2015  
<http://www.designedtomove.org/resources/active-schools>
- School Sport: Workforce and School Sport Club Development Evaluation, Sport Industry Research Centre, 2014

- Young Ambassadors Programme: Final evaluation report, RM Insight Research Evaluation Surveys, 2014.  
*Please contact the Youth Sport Trust (YST) for information relating to the two reports listed above.*
- Steps to Solving Inactivity, UKActive, 2014  
[http://www.ukactive.com/downloads/managed/Final\\_Final\\_Final\\_Steps\\_to\\_Report.pdf](http://www.ukactive.com/downloads/managed/Final_Final_Final_Steps_to_Report.pdf)
- Fit for Girls: Final summary report (and case studies pack), Sport Scotland/ Youth Sport Trust, 2014  
[http://www.sportscotland.org.uk/resources/resources/fit\\_for\\_girls\\_evalutaion\\_final\\_report/](http://www.sportscotland.org.uk/resources/resources/fit_for_girls_evalutaion_final_report/)  
[http://www.sportscotland.org.uk/resources/resources/fit\\_for\\_girls/](http://www.sportscotland.org.uk/resources/resources/fit_for_girls/)
- Active Schools Evaluation: Sport Scotland, ODS Consulting, 2014  
<http://www.sportscotland.org.uk/media/1374298/active-schools-evaluation-report-final.pdf>
- National Healthy Schools Programme: Final Report, National Centre for Social Research, 2011  
<http://www.natcen.ac.uk/media/28170/evaluation-national-healthy-schools.pdf>
- Healthy Schools: Physical Activity, British Heart Foundation and Crown copyright, 2007  
[http://www.nottinghamhealthyschools.org.uk/downloads/pa\\_bookleta.pdf](http://www.nottinghamhealthyschools.org.uk/downloads/pa_bookleta.pdf)
- Grounds for Improvement: Secondary Action Research Programme, National Foundation for Education Research , 2004  
[http://promiseofplace.org/research\\_attachments/Rickinson2004GroundforImprovement.pdf](http://promiseofplace.org/research_attachments/Rickinson2004GroundforImprovement.pdf)
- National Healthy School Standard (NHSS): Physical activity, Department for Education and Employment and Department of Health, 2000  
[http://www.getberkshireactive.org/library/client/Research/Education/20130626-physical\\_activity\\_report\\_v.pdf](http://www.getberkshireactive.org/library/client/Research/Education/20130626-physical_activity_report_v.pdf)

### **Telephone interviews**

The aim of the telephone interviews was to provide us with further in depth information about exemplar projects from around the UK, with a specific focus on components of the various interventions or programmes that have focused on changing or modifying the school environment. This included more information about the success of the programme (if and how it was evaluated), perceptions of acceptability and feasibility, the implementation of programme (what worked well/any barriers to success) and also more information on any ongoing projects that have not yet been evaluated (e.g., any details of the programme, any evaluation/outcomes that will be conducted and perceptions of success of the programme). Finally, we also wanted to know more about what projects these individuals would like to commission/try and any barriers to these ideas.

We conducted four phone interviews with representatives from:

- **Sport Scotland**
- **Southampton City Council**
- **Active Schools, Dundee City Council, Scotland**
- **Camden Active Spaces**

## Key findings:

The findings from the reports and telephone interviews have been synthesized in the sections below to provide an overview of the key features of interventions and programmes that have attempted to modify the school's environment (physical, social and policy features) to increase adolescent PA along with the barriers to implementation and information about monitoring and evaluation.

### 1. Leadership (and teacher behaviours)

- A **supportive school environment** is key to any wider changes to the school environment (regardless of what 'feature' of the school environment you are trying to change)
- There is a need to have **devoted staff** leading the initiatives and changes within schools – for example, staff members as PA 'champions' (not necessarily PE staff).
- The key is that that staff become involved in initiatives and programmes to change the school environment because they *want* to – not because they have to.
- Schools should work towards **helping parents understand and appreciate importance of PA** for their children.
- This requires some level of **professional development** training to ensure the existing school workforce understand how and why changes need to be made and they are equipped to implement changes.



#### Teacher behaviours

- All teachers and school administrators should **encourage PA** in students
- All staff should have a role in the **supervision of structured and unstructured PA**
- All teachers **speak positively about PA** and encourage students to set and work towards a PA goal
- **PA is never used or withheld as punishment**
- All school staff are **positive role models** for PA – it is important that children see teachers being active too.

#### Examples of effective leadership

**Workforce Development and School Sports Clubs, YST:** As part of establishing a wider YST initiative at Blessed Robert Sutton sports college Staffordshire, non-PE staff were recruited to help embed newly established sports clubs within the school and to help engage 'non-sporty' students and to make the clubs less formal than the more traditional sports clubs run by PE teachers.

**Fit for Girls, Sport Scotland:** One component in the Castlebrae Girls Project in Edinburgh (as part of a wider approach to increase girls' participation in PE and extra-curricular activities) was the establishment of a Friday breakfast club in which girls could engage in dancing or running and then eat breakfast together. This included other female members of staff also taking part alongside the girls.

**Active Schools, Sport Scotland:** Most of the funding for these initiatives goes to staffing. Specifically, the funding of Active Schools Coordinators and managers that facilitate the wider changes made within the school environment helps to develop school-club links, organise taster sessions and lead and organise consultation with students about ideas and programmes.

## 2. School policies to support a culture of physical activity

- All **students and staff should understand how and why PA is good for them** – including the benefits beyond health (e.g., stress, anxiety, mental-well-being, self-esteem, concentration, school satisfaction etc).
- Schools should **prioritise PA** (includes embedding this priority within wider curriculum)
- Schools should provide more diverse (including more non-competitive) extra-curricular activities for students to be involved in – student input is essential here.
- Schools should **set targets for PA** and develop policies in order to achieve these targets.
- Important that the school **promotes and supports options for active travel** – including links to local and national initiatives where possible. For example, the provision of transport is essential for students that travel by bus from a long distance to enable them to take part in extra-curricular activities.
- Schools should provide opportunities for **whole-school PA events** (intramurals, inter-form events etc.) – essential to have all students participating at some level, and ideally teachers too.
- Policies should **recognise and celebrate students who are involved in PA organisation** and those who participate in PA (both inside and outside school).



### *Examples of changing the school culture*

**Active Schools and Fit for girls, Sport Scotland:** The Active Schools Coordinators are essential and central to initiating change for the wider school culture surrounding PA.

**Active Schools, Sport Scotland:** One example from a school in East Renfrewshire, Scotland was that as a result of the Active Schools initiative, there has been a wider cultural shift in that all students and teachers now wear tracksuits as part of uniform - PA is seen as just as important as any other part of the curriculum.

**National Healthy Schools Programme, Physical Activity report:** As part of the NHSP, schools attempted to increase the number of extra-curricular opportunities and diversify the activities that were available as well as providing access to equipment at break and lunchtimes (amongst other components).

## 3. PA embedded in the curriculum

- In order to create a culture of PA that runs through the school – PA should ideally be **embedded in the wider curriculum (beyond PE)**. This includes providing opportunities to be active throughout the school-day.
- Some **active lessons** should feature in the curriculum for all subjects.
- Students' PA participation (in school and outside of school) should be included in school reports and positively reinforced.



- **'Active' classrooms** involve relaxing the rules to include active components of the lesson in which students are allowed to move around more than usual and potentially the use of active 'furniture' such as adjustable or standing desks.

*Although the idea of embedding PA within the wider school curriculum was referred to in multiple reports, there were no specific examples of curriculum focused intervention or initiatives that have focused on active lessons or classroom design in **secondary school** students.*

#### **4. Student led decision making and autonomy**

- Any changes to the school environment (physical, social or policy) should involve a **consultation with students**.
- Students should have **input into the activities** (intramural and extracurricular) – to ensure that they are age, gender and culturally appropriate
- The use of **student champions** to serve as role models to other students and to encourage peers to join the sports clubs and become involved in PA events is recommended.



#### *Examples of student led decision making*

**Workforce Development and School Sports Clubs, YST:** Involves training young people as leaders to deliver sport and PA opportunities in schools. The focus is on student led activities – sport clubs set up by young people for young people. The programme involves getting students to be in charge of organising and running inter-form competitions, with incentives for volunteering in such events. Students in schools are also linked with local clubs; students become the junior club champion to establish better links with local clubs.

**Young Ambassadors programme, YST:** At 'Middleton' school, the young ambassadors organised a school wide event (reflecting Olympic and Paralympic values) that targeted non-sporty students to be involved. Students used 'maths activities' to engage with a broader audience and to help students appreciate the way in which particular subject knowledge could be relevant to sport and PA. Students also redesigned and organised the summer school games day which involved opening-up the range of available sports and including fun activities such as crazy golf and Zumba dance in addition to mainstream athletics events.

**Camden Active Spaces:** This project involves the re-designing of existing playground structures. The design team worked with students and all their ideas were discussed and acted out prior to implementation.

**Active Schools, Sport Scotland** – All the initiatives involve consultation in schools with students, parents and teachers using school-wide surveys. For example, in Fife a consultation took place specifically with students who do not participate in PA, including those with low self-esteem. This facilitated the creation of greater opportunities to be active for these students. This enables approaches to be tailored to the individual school and needs of the students.

## 5. The physical environment (facilities and the outdoor space)



- Children should be allowed to use school sports **facilities before and after school**.
- Agreements with local facilities and parks (if facilities not available at school site).
- Allow facilities to be **used by the wider community** where possible.
- **Consultation with students** about changes to their school's physical environment is crucial.

### *Examples of changes to the physical environment*

**Workforce Development and School Sports Clubs, YST:** School facilities used as 'satellite' clubs (sessions put on by a local club on school facilities) so that students could encourage peers to come along and try out new activities.

**Camden Active Spaces:** New outdoor facilities in secondary schools (and primary schools). They are designed with the students to create original, imaginative, challenging structures in the playgrounds of schools in Camden.

**Active Schools, Sport Scotland:** In Argyll and Bute, there are examples of schools making the most of their local natural environment surrounding the school to overcome a lack of school facilities. This includes activities such as Nordic walking.

**Grounds for improvement:** All case studies involve detailed consultations with students about their school's outdoor design.

## 6. The PE environment

- PE policy should mean that all students receive at least **150 minutes of PE** per week.
- Policies should mean that students are at least **moderately active (e.g., equivalent of brisk walking) for at least 50%** of the lesson.
- PE should be well-planned, broad and includes a **wide range of activities** – student input is essential here.
- **'No excuse policy'**: all students must be involved in PE. All students can take part in PE – even if not able to take part in physical activities. For example, activities can be adapted or students can be assigned to other duties such as an umpire or coach.
- Students receive feedback reports that illustrate PE achievements and how they can improve.
- **PE changing facilities** can be important for *girls'* motivation to participate in PE
- **PE kit policies** should be relaxed to allow girls to wear what is comfortable for them to facilitate participation.



### *Examples of changes to the PE environment*

**Fit for girls, Sport Scotland:** In Castlebrae and Newbattle schools, hair dryers and straighteners were added to girls' changing rooms – which students can access in own time. Other components to improve the engagement of girls in PE were to add curtains/improve showers in the changing rooms. Other Fit for Girls components involve the school's purchasing PE kits (which are kept and washed at school). There are also some examples of girls selecting (and/or designing) a new PE kit. The Whitburn academy implemented a no excuse policy and also displayed a notice board and DVD player showing positive female role models being active, in addition to offering new activities offered in PE.

**Nike/YST Girls in Sport initiative:** Aims to equip secondary school teachers with the appropriate skills and ideas to provide forms of physical education and sport opportunities that would foster long-term change in girls' involvement in sport. This involves grouping students by similar ability in PE, praising efforts and personal achievements, allowing relaxed rules around PE kit, involving girls in the planning and delivery of PE, and decreasing competitive clubs and increasing recreation and /or aesthetic clubs to promote female involvement.

### ***Barriers to changing the school environment***

A range of barriers to implementing change within secondary schools were reported across several documents and also within the telephone interviews we conducted. The most widely cited barriers to changing the school environment to facilitate PA in secondary schools were:

- A lack of **funding** (especially for secondary schools compared to primary schools);
- A lack of **resources** (including time) to implement changes;
- Wider pressure from educational bodies that **prioritise other subjects** over PE and PA in general.

### ***Monitoring and evaluation of school-environment interventions:***

- Of the reports we reviewed, there have been **very limited rigorous evaluations** of interventions or programmes that have attempted to change the school environment.
- The majority of the interventions and programmes highlighted in this report are 'complex' programmes and interventions that **comprise multiple components, targeting very different features of the school's environment** (e.g., policy change, changes to the physical environment and ultimately overall changes to the school's culture and ethos (i.e. the wider social environment). This makes a comprehensive evaluation very difficult.
- Most of the evaluations provide **anecdotal feedback from schools** regarding their perceptions of the programme and what impacts it has had (e.g., on pupil engagement in PE classes).
- Some of the more rigorous evaluations have utilised a **mixed-methods** approach in which they combine the monitoring of extra-curricular activities that are offered in schools, in addition to surveys and qualitative approaches such as focus groups and interviews with students, teachers and Active Schools Coordinators to explore impacts and outcomes of the programmes/interventions.

- The evaluations have typically utilised **surveys** to measure student **participation** and engagement in sport and PA. However, these have usually been completed by a **proxy** (e.g., by Active School Coordinators) rather than self-reported by students in the schools taking part. Furthermore, these are **not** usually conducted at baseline (i.e., before the intervention is implemented), therefore limited conclusions about programme effectiveness can be drawn.
- Most of the ‘impact’ evaluation has focused on **participation** (in PE classes or extra-curricular clubs) rather than PA levels. There are no examples of objectively measured PA.
- There are some examples of positive effects on student **psycho-social outcomes** such as attitudes, knowledge, self-esteem, body-image, problem-solving skills –this is typically ascertained by qualitative feedback about the project.
- We identified very limited examples of rigorous **process evaluations** that have explored the fidelity of policy/environmental changes (e.g., was the intervention/programme delivered and implemented as intended?). Most of the examples monitored how many additional PA opportunities were established and how many students participated but did not look at wider processes such as teacher behaviours and the implementation of various policies.
- To our knowledge, there is only one example of a planned rigorous evaluation (i.e., measures objective PA) in which a local authority is collaborating with a University. Specifically, Camden Active Spaces is currently being evaluated in conjunction with UCL. This **longitudinal quasi-experimental design** utilises objective measures of PA and measures of children’s behaviour, mental health, engagement and well-being. This study uses a (non-random) control school to be able to draw stronger conclusions about the effects of this intervention and thus represents a comprehensive planned evaluation.

*Reported challenges to rigorous evaluation:*

- A lack of **funding** to conduct a rigorous evaluation that includes baseline assessment of key outcomes, and objective measures of PA (and broader health outcomes) is a key barrier to improved evaluation.
- Reported difficulties in **monitoring students** (e.g., schools not willing to share information about students) in order to track changes in PA engagement over time.
- The nature of interventions and programmes to change the school environment is that they are **multifaceted and target several features of the school’s environment**. This makes it difficult to know what change is driving the impact findings (e.g., is it the changes to certain policies or simply the provision of more extra-curricular opportunities)? Furthermore, these **approaches are often tailored to the needs of each school**; therefore the exact policies and broader environmental changes that the school makes will be unique to that school. This makes a blanket evaluation very difficult.

## Discussion of the main findings

### *Key Recommendations for creating active school environments*

Without rigorous evaluations of the intervention/programme components, the conclusions that can be drawn about their effectiveness are limited. However, across the multiple case studies highlighted within this report and the information collected from the telephone interviews, there appears to be several key recommendations for creating active school environments:

- It is consistently shown that **tailoring** approaches are the key to their success. A ‘one size fits all’ approach will not work in this context.
- A tailored approach to modifying the wider school environment to promote PA involves schools **consulting with students and staff** to make changes that reflect the students’ needs. Other factors for success are **leadership and support** from within the school (and from outside sources such as Active School Coordinators).
- It is useful to think of schools as ‘workplaces’; there is a need to focus on the **whole school outcomes** (i.e., not just target students but also target teachers and other staff) to promote PA and reduce sedentary behaviour as a means to reduce stress and promote more general psychological well-being.

Although several frameworks and guidance documents exist (e.g., National Healthy Schools Standard, WHO school policy framework, NICE Promoting PA for children and young people, Healthy Schools PA resources etc.) that outline how schools can promote PA via changes to their wider school environment, there remains very few rigorous evaluations of these sorts of initiatives in secondary schools.

- There have been no initiatives that have attempted to **decrease sedentary behaviour** during the school day or tried to change **classroom policies** (e.g., to incorporate activity breaks, active lessons or standing desks).
- Most initiatives in this report focus on the provision of extra-curricular activity or improvements to PE (i.e., opportunities for moderate-to-vigorous PA).

Taken together, this suggests that there needs to be a better understanding of what constitutes the school ‘environment’ (e.g., physical AND social/policy features) and also a shift in the wider understanding about how we can shift the *intensity* of activity – such as changing sedentary behaviour into light PA. This involves a movement away from the traditional outcomes of ‘participation in sport’ and ‘bouts of moderate-to-vigorous PA’.

There appears to be consensus that to derive any change in students PA (and general health and well-being), interventions or approaches need to target the overall school culture and ethos. Although many examples of good practice and case studies highlight how this can be achieved (i.e., importance of strong leadership within the school), the examples should be provided with a reference to the UK education context. As reported in a recent BMJ article by Bonell and colleagues (2014), “participation in the National Healthy Schools Programme no longer benefits from governmental targets or funding. Ofsted reports no longer focus specifically on how well schools promote students’ health or personal development. Personal, social, and health education (PSHE) remains a non-statutory subject, and schools

spend less and less time teaching it because of pressure to focus on academic subjects.” Although this article relates to health in general (not specifically to PA), the wider political and educational context must be taken into account for future efforts that target the school environment to promote PA and reduce sedentary behaviour. It may be that higher-level changes are required in order to help schools become better promoters of physical activity (e.g., Ofsted requirements for PA policies).

### ***Implications for research: the school environment and adolescent physical activity***

- Evaluations need to look beyond PA participation and engagement – they should also focus on attainment, attendance and mental health and well-being. It has also been suggested that evaluations should look at the same outcomes in school staff – as any initiative to change the school environment should change behaviour of students and staff (i.e., a whole school approach)
- The plans for a rigorous evaluation (outcome and process evaluation) should ideally be linked to the programme/intervention delivery from the start. This means an evaluation can be built in from the start and appropriate baseline measures taken in order to be able to look at measures of change over time.
- A rigorous process evaluation should also look at the fidelity of the intervention/programme delivery- for example, was the intervention delivered as intended (e.g., policies implemented and adhered too? Did the teachers change their behaviours in line with broader changes to the school culture?). This also allows researchers to identify the ‘active ingredients’ of complex interventions.

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### **Further Reading**

Bonnell, C. (2014). Why schools should promote students’ health and wellbeing. *BMJ*; 348:g3078

Morton, K. L., Atkin, A., Corder, K., Suhrcke, M., van Sluijs, E. (in press). The school environment and adolescent physical activity and sedentary behaviour: A mixed studies systematic review. *Obesity Reviews*.

Public Health England (2015) What Works in Schools and Colleges to Increase Physical Activity? <https://www.gov.uk/government/publications/what-works-in-schools-to-increase-physical-activity-briefing> - this was published after our search phase and was therefore not included in the present report.

Smith L., Kipps, C., Aggio, D., et al. (2014). Camden active spaces: Does the construction of active school playgrounds influence children’s physical activity levels? A longitudinal quasi-experiment protocol. *BMJ Open*; 4:e005729.