

Institution: University of Bristol		
Unit of Assessment: 24) Sport and Exercise Sciences, Leisure and Tourism		
Title of case study: Innovative research has developed, evaluated and supported implementation of novel scaleable physical activity interventions for children and adults		
Period when the underpinning research was undertaken: 2010 - 2018		
Details of staff conducting the underpinning research from the submitting unit:		
Name(s):	Role(s) (e.g. job title):	Period(s) employed by submitting HEI:
Ashley Cooper	Professor of Physical Activity & Public Health	01/1997 - present
Russell Jago	Professor of Paediatric Physical Activity & Public Health	07/2005 - present
Angie Page	Professor of Physical Activity & Public Health	09/1994 - present
Angeliki Papadaki	Senior Lecturer in Nutrition	09/2012 - present
Simon Sebire	Senior Lecturer in Public Health Nutrition	09/2012 - present
Period when the claimed impact occurred: 1 st August 2013 - 2020		
Is this case study continued from a case study submitted in 2014? No		

1. Summary of the impact

Globally physical activity in adults and children is very low despite compelling evidence regarding increased risk of disease and death from insufficient physical activity. Scaleable interventions that can deliver benefits to large sectors of the global population are required to reduce the substantial economic and social burden of disease. University of Bristol research has developed innovations in activity measurement, intervention design and implementation to identify and test promising and, crucially, scaleable interventions. This approach combined with sustained partnership working has enabled successful delivery of interventions across multiple settings and policy arenas (schools, streets, health services), scaled up from local to international level.

2. Underpinning research

Physical inactivity is a leading cause of premature morbidity and mortality. Despite national and international policy initiatives, over one quarter of the global population remain insufficiently active. Assessing the effect of interventions to increase physical activity (PA) is limited by the difficulty of accurately measuring change in activity behaviour. To address this, researchers in the University of Bristol (UoB) Centre for Exercise, Nutrition and Health Sciences have pioneered novel objective PA measurement methods to accurately describe activity behaviour and thus to identify and evaluate potentially scaleable interventions.

Describing activity behaviour

Combining data from personal Global Positioning System (GPS) receivers and activity monitors (accelerometers), UoB research demonstrated, for the first time, the activity of children in different spatial locations, showing activity to be two-three times higher outdoors than indoors [1], and higher in green spaces such as parks. This expertise led to Cooper's involvement as a founding member of the International Children's Accelerometry Database (ICAD), pooling data from 27,637 young people (20 studies, ten countries) to generate the largest dataset of objectively derived PA data. Analysis of this dataset showed, for the first time, objective PA to decline internationally by ~5% per annum as children age [2]. This paper was awarded the prize for the most cited observational study article in 2015 in the International Journal of Behavioural and Physical Activity.

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Intervention targets in youth

Most interventions to increase youth physical activity have equivocal results, partly due to the difficulty of measuring small changes in physical activity in young people. UoB research addressed this in several studies achieving increased precision through accelerometry. For example, in 1,223 eight and nine year olds, those who regularly attended sports clubs recorded 8-10 minutes per day more moderate-to-vigorous physical activity (MVPA) than those who did not. This small but important difference meant two-thirds (67%) of attendees were more likely to meet the guidelines for physical activity [3], highlighting the importance of after-school clubs for children's activity. Commercial provision of such clubs makes them unaffordable for many. Consequently, Jago and Sebire trained teaching assistants to deliver after-school clubs, showing them how to build children's perceived competence to be physically active, and hence providing a cost-effective solution to increase physical activity in disadvantaged groups [4].

Intervention to help those at highest risk

Type 2 Diabetes Mellitus (T2DM) is increasing globally; in the UK, the burden of management and associated disease accounts for ~10% of the NHS budget. Physical activity is central to managing T2DM but increasing PA and maintaining change in people with T2DM is challenging. Despite evidence of higher PA in healthy individuals who actively commute, active commuting has not previously been used as an intervention in T2DM. In an analysis of UK Biobank data we showed that those who actively commute achieve 73-105 more minutes of MVPA per week than those not actively travelling [5]. Building on this, Cooper and Page led the first study of the utility of e-cycling in people with T2DM, showing both that e-cycling provided moderate intensity physical activity sufficient to improve health and that participants found e-cycling enjoyable, with 14 of the 18 participants purchasing an e-bike at the end [6].

3. References to the research

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- [1] **Cooper AR, Page AS**, Wheeler BW, Hillsdon M, Griew P, **Jago R**. (2010). Patterns of GPS measured time outdoors after school and objective physical activity in English children: the PEACH project. *International Journal of Behavioral Nutrition and Physical Activity*, 7:31. DOI:[10.1186/1479-5868-7-31](https://doi.org/10.1186/1479-5868-7-31)
 - [2] **Cooper AR**, Goodman A, **Page AS**, Sherar LB, Esliger DW *et al.* (2015). Objectively measured physical activity and sedentary time in youth: the International children's accelerometry database (ICAD). *International Journal of Behavioral Nutrition and Physical Activity*, 12:113. DOI:[10.1186/s12966-015-0274-5](https://doi.org/10.1186/s12966-015-0274-5)
 - [3] **Jago R, MacDonald-Wallis C, Solomon-Moore E**, Thompson JL, Lawlor DA, **Sebire SJ**. (2017). Associations between participation in organised physical activity in the school or community outside school hours, and neighbourhood play with child physical activity and sedentary time: a cross-sectional analysis of primary school-aged children from the UK. *BMJ Open*, 7:e017588. DOI:[10.1136/bmjopen-2017-017588](https://doi.org/10.1136/bmjopen-2017-017588)
 - [4] **Jago R, Sebire SJ, Davies B, Wood L, Edwards MJ, Banfield K, Fox KR**, Thompson JL, **Powell JE**, Montgomery AA. (2014). Randomised feasibility trial of a teaching assistant led extracurricular physical activity intervention for 9 to 11-year olds: Action 3:30. *International Journal of Behavioural Nutrition & Physical Activity*, 11:114. DOI:[10.1186/s12966-014-0114-z](https://doi.org/10.1186/s12966-014-0114-z)
 - [5] Falconer CL, **Cooper AR**, Flint E. (2017). Patterns and correlates of active commuting in adults with types 2 diabetes: cross sectional evidence from UK Biobank. *BMJ Open*, 7(10): e017132. DOI:[10.1136/bmjopen-2017-017132](https://doi.org/10.1136/bmjopen-2017-017132)
 - [6] **Cooper A**, Tibbitts B, England C, Procter D, Searle A, **Sebire S**, Ranger E & **Page A**. (2018). The potential of electric bicycles to improve the health of people with type 2 diabetes: a feasibility study. *Diabetic Medicine*, 35(9), 1279-82. DOI:[10.1111/dme.13664](https://doi.org/10.1111/dme.13664)

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Key research funding:

- [i] **Jago R.** [Action330: Promoting children's physical activity via enhanced after-school leadership](#), MRC, 2012-2014, GBP393,608
- [ii] **Cooper AR.** Cooper - Theme lead 'Sedentary Behaviour and Type 2 diabetes'. NIHR Biomedical Research Unit in Nutrition, Diet and Lifestyle, 2012-2017, GBP4.5 million
- [iii] **Page A.** Evaluation of the Street Play Project, Department of Health, 2013-2016, GBP1.01 million

4. Details of the impact

The magnitude of the problem of inactivity requires the delivery of interventions at scale in multiple settings and countries to achieve meaningful impact. UoB research incorporates innovation in measurement to identify and evaluate the most promising markers for intervention. The research findings are communicated via sustained knowledge exchange, public engagement and partnership working, to provide exemplars and evidence, for practitioners and policymakers, to promote positive change in multiple settings. The impact of this is encapsulated in the following three exemplars:

a) National policy change and global impact via increased scale and reach of street play

UoB research quantifying the contribution of time spent outdoors to children's activity levels [1], supported the development of a novel street play initiative delivered by a social enterprise Community Interest Company 'Playing Out CIC' (presented as a case study in REF2014). Since 2014, the number of streets in England that have had street play sessions has increased from 312 in 33 Local Authorities in 2014, to 800 in 77 Local Authorities in 2018, estimated to benefit 24,000 children [Ai]. Approaches building on the Bristol model now operate in 22 countries across North & South America, Europe and Australasia [Aii].

In 2017, the national evaluation of the street play model, led by Page and funded by the Department of Health [iii], highlighted that children achieve 16 minutes of health-enhancing physical activity during street play sessions, as well as improved well-being [B]. Crucially, the evaluation demonstrated that the intervention is scaleable (achieving national spread) and reaches those who are most deprived across multiple geographical areas [B]. This rare success for a low-cost community led intervention, has been noted in national policy reports including the Children's Commissioner for England's report 'Playing Out' [Ci], promoting the importance of play to offset low levels of children's physical activity. The report [Ci], cites the evaluation [B] and calls on local authorities to play a '*more proactive and supportive role in arranging the sessions*'. This was reflected in new guidance provided by the Department for Transport (2019), which recommended to councils that advertising is not necessary to close roads for play. This removed a major barrier and cost to opening up streets for play [Cii].

The street play evaluation report [B], also revealed an additional physical activity benefit of temporary street closures as the opportunity to learn to cycle, which is evident in data from parental interviews as well as those taking part [B]. This has been formally recognised in an innovative partnership between British Cycling and Playing Out [D] and endorsed by Olympic cyclist Jason Kenny's call to close roads for outdoor play to help children learn to cycle (featured on BBC Radio 5 Live (Sep 2019)).

b) Policy support and increased opportunity for physical activity for adults

Despite rapid acceleration in access to and purchasing of e-bikes (e.g. e-bike sales in Europe increased by 21% from 2016 to 2017 and are predicted to increase from 3.7 million in 2019 to 17 million in 2030; figures from 2020 show a 23% increase in sales during the COVID-19 pandemic), research on e-bikes and health is in its infancy. Based on our research publishing the first systematic review on e-bikes and health, and the successful development of an e-bike intervention for people living with T2DM [6], UoB is recognised as the key source of expert knowledge for e-bikes within Trade bodies [Gi, Gii], charities (RoSPA factsheet 2018), general interest (Electric Bike Report Jun 2018) and National media (Daily Express May 2018), including during the COVID-19 outbreak (How coronavirus made 2020 the year of the electric bike; Conversation Dec 2020). We have worked in several ways to support policy action and implementation, including with national agencies such as Sustrans who manage the account for delivery of change in active travel in Scotland. In 2018, the Scottish Government increased this account from GBP40 million to GBP80 million, with a specific policy action to provide advice on the use of e-bikes to deliver economic and health benefits. In addition, creation of demonstration projects have highlighted that clinical commissioning groups (CCGs) are willing to commission active travel projects as an alternative to more established methods to promote increased physical activity in high-risk individuals (e.g. Stockton CCG promoting active travel). Our research has also been used to present alternatives to established practice for diabetes treatment in Bristol via Diabetes Education days. These days are the main component of programmes offered by the NHS for treatment to patients newly diagnosed with diabetes. Bristol health services have agreed to present the video [E] of participants involved in UoB research [6], as a consistent component of their Education Days, offering the unique opportunity to refer participants to try out an e-bike as a way to help manage their diabetes. The positive impact on people living with T2DM who are supported to use an e-bike, is exemplified in the video [E] and consistent with the unique feel-good factor felt when using an e-bike. This is particularly important for adults, including those living with T2DM, who often have many failed attempts to change physical activity behaviour [5].

This engagement has led to: a) new strategies and capacity for third sector agencies (Lifecyle UK [Fi] & Forth Environment Link [Fii]), who have broadened their portfolio to include e-bike loan and promotion, enhancing the sustainability of their business model and targeting high risk groups including people with T2DM and cancer survivors; and b) business growth plans for e-bike providers who have used our research [Gi] to highlight the health benefits of e-biking to promote schemes to offset costs for electric bikes, which *“would help some of the six million over-55s who are currently classed as ‘inactive’”* Pure Electric Chief Executive [Gii].

Collaboration with key national agencies has also increased representation of e-bikes in national and international monitoring and surveillance tools. For example, we worked with leaders of the National Travel Survey to introduce the first e-bike question into their survey from 2019 [H]. The National Travel Survey is the longest standing survey on travel, has been copied in many countries and underpins Government policy, so this addition is a major milestone.

c) Increased provision and quality of extracurricular physical activity

UoB has a strong legacy of public engagement to underpin impact, particularly with local schools, including generation of the successful FABKIDS outreach programme. This programme has been delivered in schools over 80 times, to more than 2,550 year 5 and 6 pupils between 2014 and 2019, to encourage children to think about their lifestyle. Building on these knowledge translation activities and strong school partnerships, our research highlighting the importance of after-school clubs as a source of physical activity [2, 4], has informed the development of a new scheme in

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partnership with local schools and sports providers called ACE. ACE is an assessment checklist [I], developed in response to the needs of local authorities, primary schools and sports and children's activity providers, which ensures high-quality extracurricular provision of physical activity and food in primary schools through external providers. ACE particularly targets children who do not take part in team sports as well as promoting healthy food options that are acceptable within children's peer groups. This approach to integrating food and physical activity complements similar work leading on developing new standards for all outlets selling/serving food, called the Bristol Eating Better Award [Ji]. Papadaki provided input on metrics to define content of the award along with advice on approach to evaluation. The Bristol Better Eating Better Award was subsequently highlighted as a case study in support of Bristol City Council's Healthy Weight Strategy (2017) [Jii].

Ukactive is a membership organisation of 4,000 public, private and third sector partners, and exists to improve the health of the nation by getting more people, more active, more often. Citing UoB research into the benefit of out-of-school clubs for physical activity [3], ukactive recommended that Government should fund these activities [Ki (p.23.)], which would particularly help the most disadvantaged, hard-to-reach children, remain active and well-fed. Ukactive also recognised the value of the ACE award, and agreed to license it in 2019 [Kii] as a means of driving national implementation for improved after-school and school holiday club providers. The collaboration means that (i) the award can be rolled out nationally; (ii) delivery of higher-quality physical activity and food provision in after-school clubs can be monitored; and (iii) provide better data on after-school club policies can be fed into local and national policy. The ACE award therefore provides a new pathway to accelerate impact on children's physical activity and food intake within the after-school setting [Ki].

These multiple efforts accelerating impact in the schools arena, were recognised by Baroness Tanni Grey-Thompson, Chair of ukactive's Board, who thanked Jago for '*... the contribution you have made toward championing the vital importance of physical activity in society*' [Kiii].

5. Sources to corroborate the impact

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- [B] Play England (Page AS et al.) (2017). [Why temporary street closures for play make sense for public health](#)
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 ii) GOV.UK (2019). News: [Revised road closure guidance to boost children's outdoor play](#)
- [D] British Cycling (2019). [British Cycling announces collaboration with Playing Out](#)
- [E] University of Bristol (2018). Video: [Think e-bikes are cheating? Think again!](#)
- [F] i) Life Cycle UK (2018). [Are e-bikes cheating?](#)
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 ii) Retail Gazette (2021). [Pure Electric calls for government grant to help retirees buy bikes](#)
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- [I] ACE UK Award - ACE checklist and development paper
- [J] i) Bristol City Council (2019). [Bristol Eating Better Award](#)
 ii) Bristol City Council (2017). [A Strategic Plan for Healthy Weight in Bristol](#) (see p.13.)
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