Mixed method evaluation of the Virtual Traveller physically active lesson intervention: An analysis using the RE-AIM framework

E. Norris[a,b,*], S. Dunsmuir[c], O. Duke-Williams[d], E. Stamatakis[e], N. Shelton[b]

[a] Centre for Behaviour Change, University College London, 1-19 Torrington Place, London, WC1E 7HB, UK
[b] Department of Epidemiology & Public Health, University College London, 1-19 Torrington Place, London, WC1E 7HB, UK
[c] Department of Clinical, Educational and Health Psychology, University College London, 26 Bedford Way, London, WC1H 0AP, UK
[d] Department of Information Studies, University College London, Foster Court, London, WC1E 6BT, UK
[e] Charles Perkins Centre, Prevention Research Collaboration, School of Public Health, Sydney Medical School, University of Sydney, Australia

ARTICLE INFO

ABSTRACT

Background: Physically active lessons integrating movement into academic content are a way to increase children's physical activity levels. Virtual Traveller was a physically active lesson intervention set in Year 4 (aged 8–9) primary school classes in Greater London, UK. Implemented by classroom teachers, it was a six-week intervention providing 10-min physically active Virtual Field Trips three times a week. The aim of this paper is to report the process evaluation of the Virtual Traveller randomized controlled trial according to RE-AIM framework criteria (Reach, Effectiveness, Adoption, Implementation and Maintenance).
Methods: A mixed methods approach to evaluation was conducted with five intervention group classes. Six sources of data were collected via informed consent logs, teacher session logs, teacher and pupil questionnaires, teacher interviews and pupil focus groups.
Results: High participation and low attrition rates were identified (Reach) alongside positive evaluations of Virtual Traveller sessions from pupil and teachers (Effectiveness). Participants were from more deprived and ethnic backgrounds than local and national averages, with Virtual Traveller having the potential to be a free intervention (Adoption). 70% of sessions were delivered overall (Implementation) but no maintenance of the programme was evident at three month follow-up (Maintenance).
Conclusions: Mixed method evaluation of Virtual Traveller showed potential for it to be implemented as a low-cost physically active lesson intervention in UK primary schools.

1. Background

Current World Health Organisation (World Health Organisation, 2010) and UK physical activity guidelines (Department of Health, 2011) recommend that school-aged children should spend at least 60 min per day in moderate-to-vigorous physical activity. However, only 18.5% of UK children met these guidelines (Scholes & Mindell, 2012). A range of school-based interventions have been developed to improve children's low activity levels (Dobbins, Husson, DeCorby, & LaRocca, 2013), as schools allow frequent access to diverse children over regular, extended periods of time (Fox, Cooper, & McKenna, 2004).

Physically active lessons which integrate movement into academic teaching have recently been tested in schools (Norris, Shelton, Dunsmuir, Duke-Williams, & Stamatakis, 2015a). A developing evidence base has shown physically active lessons to increase physical

activity (Donnelly et al., 2009; Goh et al., 2014), academic achievement (Mullender-Wijnsma et al., 2016) and time on-task (Mahar et al., 2006; Mullender-Wijnsma et al., 2015), with research typically run in primary schools with pupil aged under 12 (Norris et al., 2015a). For example, Donnelly and colleagues found their 3-year 'Physical Activity Across the Curriculum' (PAAC) randomized controlled trial to be associated with 27% greater overall moderate-to-vigorous physical activity compared to control group (Donnelly et al., 2009). However, short follow-up periods, poor activity measurement (Norris et al., 2015a) and non-diverse pupil samples (Neelon, Hesketh, & van Sluijs, 2016) are limitations evident in physically active lesson research to date.

The current evidence base for physically active lessons is often drawn from relatively small-scale or pilot studies, which focus on assessing outcome effectiveness rather than also assessing the processes underlying these effects (Norris et al., 2015a; Webster et al., 2017). Process evaluations include assessment of the context in which an

Table 1
Process evaluation measures and their fit within the RE-AIM framework.

Level	Dimension	Definition	Data collection timeframe	Data collected
Individual	Reach	1. Participation rates among eligible classes	T0	1. Researcher logged
		2. Participation rates among eligible pupils	T0	2. Returned consent sheet
		3. Representativeness of participants compared to non-participants	T0	3. Returned consent sheet, pupil demographic questionnaires
Individual	Effectiveness	1. Effects on primary physical activity outcome measures	T1-T4	1. Assessed in Norris et al. (in press)
		2. Effects on secondary outcome measures of physical activity, on-task behaviour and student engagement outcome measures	T1-T4	2. Assessed in Norris et al. (in press)
		3. Perceptions of intervention sessions	T1-T2	3. Teacher intervention log, teacher and pupil evaluation questionnaires, teacher interviews and pupil focus groups
		4. Perceived physical exertion in intervention sessions	T1-T2	4. Pupil evaluation questionnaire (OMNI scale; Robertson et al. (2000)), teacher interviews and pupil focus groups
Setting	Adoption	1. Representativeness of participating classes	T0	1. Pupil demographic questionnaires, teacher demographic questionnaires
		2. Costs of intervention	T1-T2	2. Researcher reported
Setting	Implementation	1. Extent the intervention is delivered as intended	T1-T2	1. Teacher intervention log, teacher interviews and pupil focus groups
		2. Time required to deliver intervention	T1-T2	2. Teacher interviews and pupil focus groups
Both	Maintenance	1. (Individual) Impact of attrition on outcomes	T1-T4	1. Researcher logged
		2. (Organisational) Continuation or modification of intervention beyond intervention period	T3-T4	2. Teacher interviews

intervention was delivered and the extent it was delivered as intended (McGoey, Root, Bruner, & Law, 2016). Medical Research Council guidelines for complex interventions recommend that these processes are assessed to allow better interpretation of findings and help identify required adjustments for future iterations (Medical Research Council, 2013; Oakley, Strange, Bonell, Allen, & Stephenson, 2006). Other school-based physical activity interventions have previously reported full process evaluations to allow assessment of implementation, context and costing (Jago et al., 2015; McGoey et al., 2016; Sebire et al., 2016). As physically active lessons are still relatively novel (Norris et al., 2015a), it is important that authors report full process evaluations to allow more effective future iterations to be developed. For example, the EASY Minds physically active lesson intervention performed a process evaluation featuring teacher sessions logs and pupil and teacher questionnaires (Riley, Lubans, Morgan, & Young, 2015; Riley, Lubans, Holmes, & Morgan, 2016). However, this process evaluation was only briefly reported and was not performed or described according to any evaluation framework.

The use of robust evaluation tools such as the widely used RE-AIM framework (Reach, Effectiveness, Adoption, Implementation, Maintenance) (Glasgow, Vogt, & Boles, 1999) helps to ensure that all aspects of process evaluation are assessed. In brief, Reach assesses the rate of participation and the sample's representativeness, Effectiveness assess the intervention's effects on outcomes, Adoption measures the potential influence of setting characteristics and real-world costs, Implementation assesses the extent the intervention was delivered as intended and Maintenance explores the level of sustained individual- and organizational-level behaviour change following the intervention (Gaglio, Shoup, & Glasgow, 2013; Glasgow et al., 1999). RE-AIM has been used to evaluate physical activity interventions across community (Koorts & Gillison, 2015), school (Dunton, Lagloire, & Robertson, 2009) and workplace environments (Dubuy et al., 2013). However, a review of child physical activity interventions using RE-AIM found that 80.8% of 78 interventions included less than 50% of framework dimensions (McGoey et al., 2016). External validity indicators such as start-up costs, protocol fidelity and participant representativeness were typically not assessed (McGoey et al., 2016), making it difficult to infer transferability of the intervention to wider school settings. Hence for the RE—AIM framework to be maximally useful, it is important for all aspects to be incorporated into the planning and analysis of process evaluations (Kessler et al., 2012).

Virtual Traveller was a cluster-randomized controlled trial run between March 2015 and May 2016 in year 4 (8–9 years) classes within ten primary schools in Greater London (UK). The intervention provided pre-prepared physically active lessons, integrating activity into primary school maths and English teaching (Norris, Dunsmuir, Duke-Williams, Stamatakis, & Shelton, 2016). Virtual Traveller consisted of Powerpoint sessions known as Virtual Field Trips (VFTs), designed to be delivered using existing classroom interactive whiteboards. These sessions included embedded Google Earth videos showing transitions between different global locations, with on-screen prompts providing activity prompts to facilitate movement as children 'travelled' between and interact with virtual locations. A package of eighteen, 10-min sessions were provided to teachers, to be delivered by them over a 6-week intervention period (Norris et al., 2016). All Virtual Traveller sessions were developed around National Curriculum learning objectives for the age-group (Department for Education, 2013).

Intervention outcomes were physical activity assessed via accelerometers and observations, on-task behaviour assessed via observations and student engagement assessed via pupil questionnaires. These outcomes were assessed at baseline (T0), two- (T1) and four weeks (T2) during the Virtual Traveller intervention and one week (T3) and three months (T4) post-intervention (Norris et al., 2016). Virtual Traveller was developed following piloting (Norris, Shelton, Dunsmuir, Duke-Williams, & Stamatakis, 2015b) and qualitative feasibility work (Norris, Shelton, Dusnmuir, Duke-Williams, & Stamtakis, 2015c). A protocol detailing all aspects of the intervention and outcome measurement was also published (Norris et al., 2016).

We recently reported the results of the Virtual Traveller intervention, conducted in ten Year 4 classes (5 intervention and 5 control classes) (Norris et al., in press). It was found to significantly improve lesson-time physical activity and on-task behaviour but have no effect on school-day, weekend-day physical activity or student engagement (Norris et al., in press). The aim of this paper was to evaluate the processes underlying the Virtual Traveller intervention according to RE-AIM framework criteria.

2. Methods

The process evaluation included quantitative and qualitative aspects, with six data sources in total. All dimensions of process evaluation were aligned with aspects of the RE-AIM framework (Table 1). The