Virtual Traveller:  
A behaviour change intervention to increase physical activity during primary school lessons

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WHO & NHS recommend:

- 60 minutes or more of moderate or vigorous physical activity (MVPA) a day
- Minimise sedentary time

Scholes & Mindell, 2013         n=2043
2012 Health Survey for England data
• Integrating movement into teacher-led educational content
• Highlighted in recent government Childhood Obesity strategy (HM Government, 2016)

- Jumping along when counting times tables....
- Acting out movements in a story...
- Making graphs from movements (e.g. heart rate)
- Learning dance of a studied country...

Norris et al. 2015, Prev Med
Virtual Field Trips (VFTs)

>70% UK classrooms have interactive whiteboards
(FutureSource Consulting, 2010)

Use movements to explore the world and learn....

• Short sessions
• Use movements to travel between and interact with locations
• Curriculum-relevant content

Norris et al. 2015, BMC Public Health
Virtual Traveller intervention

Pilot cluster-randomised controlled trial with waiting list control

- **6 week intervention**
  - Physically active Virtual Field Trips
  - 10 minute sessions 3x a week
  - Year 4 classes (8-9 years)
    - Randomised by class
- Maths & English National Curriculum

- Measurements taken pre, during (2\textsuperscript{nd} & 4\textsuperscript{th} weeks of intervention) and post-intervention (1 week & 3 month follow-up)
- Physical activity (accelerometer & observed)
- On-task behaviour & student engagement outcomes, plus process evaluation

Norris et al., 2016; BMJ Open
Example: M2 Maths Marching

Welcome screen
Global journey of Maths Marching

‘Training’ in London
Practice times tables to marching song

Blast into space
Challenge Darth Vadar to a tables table challenge
- Increasing teacher’s **capability** to teach active lessons with training

- Increasing teacher **motivation** with training & pupil’s with prizes for longest accelerometer wear

- Increasing **opportunity** for physically active teaching

From Michie et al., 2011; *Implem Sci*

Norris et al., 2016; *BMJ Open*
Study sample & analysis

- n=219
- Year 4 (8-9 years old)
- 10 classes from 10 primary schools in Greater London

<table>
<thead>
<tr>
<th></th>
<th>Intervention (n=113)</th>
<th>Control (n=106)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boys</td>
<td>n=52 (46.1%)</td>
<td>n=59 (55.7%)</td>
</tr>
<tr>
<td>White</td>
<td>n=60 (53.1%)</td>
<td>n=45 (42.5%)</td>
</tr>
<tr>
<td>English as first language</td>
<td>n=88 (77.9%)</td>
<td>n=82 (77.4%)</td>
</tr>
<tr>
<td>Normal weight</td>
<td>n=68 (60.2%)</td>
<td>n=66 (62.3%)</td>
</tr>
<tr>
<td>Household income &lt;£15,000</td>
<td>n=33 (29.2%)</td>
<td>n=34 (32.1%)</td>
</tr>
</tbody>
</table>

- Multilevel modelling
  - Time-point (Level 1), Pupil (Level 2), Class (Level 3)
Effects on average school day physical activity

- **Moderate-to-Vigorous Physical Activity (MVPA)**
- **Light Physical Activity (LPA)**
- **Sedentary Behaviour (SB)**

* p≤0.05
Effects on lesson time physical activity

Percentage of 20-minute lesson time by physical activity intensity

<table>
<thead>
<tr>
<th>Time-point</th>
<th>Intervention</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>T0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T1</td>
<td>***</td>
<td></td>
</tr>
<tr>
<td>T2</td>
<td>***</td>
<td></td>
</tr>
<tr>
<td>T3</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>T4</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **MVPA**
- **LPA**
- **SB**

* p≤0.05; *** p≤0.001
Effects on average weekend day physical activity

![Graph showing effects on average weekend day physical activity. The graph includes data points for different time points (T0, T1, T2, T3, T4) and groups (Intervention, Control) for minutes of activity. The categories are MVPA (Moderate-to-Vigorous Physical Activity), LPA (Light Physical Activity), and SB (Sedentary Behavior).]
Effects on On-task behaviour

- Observing Pupils in Teachers and Classrooms tool (OPTIC; Merrett & Wheldall, 1986)
  - binary scoring (1: off-task, 2: on-task)

![Graph showing average OPTIC score over time points T0 to T4, with Intervention and Control groups compared. The graph indicates a statistically significant difference with *** p≤0.001.]
Process evaluation

Teacher record logs, teacher interviews (n=4/5), teacher questionnaire (n=5/5), pupil focus groups (n=24), pupil questionnaires (n=103/115)

- 70% of sessions delivered; 75.6% Maths & 64.4% English
- 9% sessions repeated by teachers
- Low costs of real-world implementation

These give us study breaks and time to stand without any extra planning which is great

There was one on persuasive writing (E7: Persuasive Writing) but we did that last term so I didn’t want to backtrack and cover it again

.. equally it would be nice to do things like this outside more without their eyes on the screen
Conclusions

The Virtual Traveller physically active lesson intervention:

- Did not change overall school or weekend day activity
- Significantly reduced sedentary behaviour & increased light & moderate-to-vigorous activity during lessons
- Significantly increased on-task behaviour

= suggests physical activity can be integrated into teaching without detriment to education

= need for increased intensity to have effect on overall day activity
Thank you for listening

PhD supervisors:
Dr Nicola Shelton
Dr Sandra Dunsmuir
Dr Oliver Duke-Williams
Dr Emmanuel Stamatakis

Study protocol:
Virtual Traveller Programme

**English**
E1: Kung Fu Punctuation 1  
E2: Kung Fu Punctuation 2  
E3: Explanation Texts  
E4: English True or False  
E5: Mystery Monsters  
E6: Noun Reverse Charades  
E7: Persuasive Writing  
E8: Frozen Vocabulary  
E9: Diary Discovery

**Maths**
M1: Tens and Hundreds Challenge  
M2: Maths Marching  
M3: Maths True or False  
M4: London 2012 Olympics  
M5: Metric Movements  
M6: Sports Galore  
M7: Rock around the Clock  
M8: Money, Money, Money!  
M9: Global Dance Count

(Norris et al., 2016; *BMJ Open*)
## Examples of Behaviour Change Elements

<table>
<thead>
<tr>
<th>Taxonomy Category</th>
<th>BCTs</th>
<th>Example in Virtual Traveller intervention</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>During teacher training</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>1. Natural consequences</strong></td>
<td>5.1 Information about health consequences</td>
<td>Included previous research showing effects of extended sitting on pupil’s health, wellbeing and educational outcomes</td>
</tr>
<tr>
<td><strong>2. Comparison of behaviour</strong></td>
<td>6.3 Information about others’ approval</td>
<td>Shared anonymous pupil and teacher feedback from VFT feasibility work</td>
</tr>
<tr>
<td><strong>3. Goals and planning</strong></td>
<td>1.4 Action planning</td>
<td>Planned where to fit 3 Virtual Traveller sessions a week in Maths and English lessons with teacher</td>
</tr>
<tr>
<td><strong>During intervention</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>4. Associations</strong></td>
<td>7.1 Prompts/Cues</td>
<td>Placed teacher log by teacher’s computer as reminder to do Virtual Traveller sessions</td>
</tr>
<tr>
<td><strong>5. Goals and planning</strong></td>
<td>1.1 Goal setting (behaviour)</td>
<td>Teachers agreed to aim to teach three Virtual Traveller sessions a week within Maths and English lessons during the intervention</td>
</tr>
<tr>
<td><strong>6. Reward and threat</strong></td>
<td>10.2 Material reward</td>
<td>Competition within each class at each assessment phase and overall for pupil who wore belt the longest</td>
</tr>
</tbody>
</table>

Norris et al., 2016; BMJ Open
Physical activity outcomes

Observed lesson time physical activity

Children’s Activity Rating Scale (CARS)

– coded as 1=stationary / 5=fast movement

- Significant time x intervention effect for both intervention periods

**Significant** time x intervention effect for both intervention periods

***p≤0.001
Student engagement

Student Engagement Instrument-Elementary Version questionnaire (SEI-E; Carter et al. 2012)

- 24 items, 4 point Likert scales

- No significant effect of Virtual Traveller intervention:

Teacher-Student Relationships

Peer Support for Learning

Family Support for Learning

Future Goals and Aspirations

Preliminary statistics
Olympic Stadium

Athletic events were held at the Olympic Stadium during the 2012 London Olympic Games.

Let's run the men's 100m final with Usain Bolt.

Q: Was the World Record broken during this race?
Potential Future VFT Work

- Different age groups
- Other subjects
- Children with SEN
- Google Expeditions