Evaluating Long-Term Effects of a Playground Redesign on Children’s Physical Activity Levels during Recess

Dr. Nicky Ridgers & Prof. Gareth Stratton
REACH Group
Liverpool John Moores University
Introduction

- Promotion of physical activity a public health priority
- Sedentary behavior a modifiable risk factor
- Traditional interventions: social & individual factors
- Physical environment changes suggested (Wechsler et al., 2000)
- Role of school in promoting healthy behaviours important (Cavill et al., 2001)
- Opportunities for activity in school: PE and recess (Sarkin et al., 1997)
- In the UK, recess occurs 2-3 times a day, 5 days/wk, 39 wk/yr (Stratton, 1999)
- Recess provides daily supplement to PE - children can engage in regular physical activity
Recess Physical Activity Research

- 9 intervention studies published 1970-2006
- 5 European (3 UK) and 4 United States studies
- Intervention summary:
  - Playground markings: 11-13% ↑ MVPA, ~ 4.5% ↑ VPA
  - Playground markings: 6.1% ↑ REE, 35% ↑ TEE
  - Daily break periods: ↑ PA pre-post-test, ↓ PA mid-post
  - Games equipment: ↑ MVPA and VPA during lunchtime
  - Fitness breaks (FB): MVPA and VPA ↑ in FB than playtime
- Main caveat: Longest follow-up has been three months
- Question mark over sustainability of interventions

Aim of Study

• The aim of the study was to:
  – Explore the 6-month effects of a playground markings intervention on boys’ and girls’ recess physical activity levels
Zoneparc Playground

Red (Sports) Zone:
- Engage in soccer, basketball, cricket, tennis
- Often fenced

Blue (Action) Zone:
- Target work, fitness & skills
- Clocks, hopscotch, jump lines, agility snakes

Yellow (Chill Out) Zone:
- Engage in word games, clapping & board games
- Seating provided
Zoneparc Playground
Method

- 298 children (149 boys, 149 girls) from 26 elementary schools (15 intervention, 11 control)
- Physical activity quantified using uni-axial accelerometer (Actigraph 7164, MTI Health Services) - epoch length = 5 s
- Threshold values identified by Nilsson et al (2002) used to determine time spent in MVPA and VPA during recess
- Total percentage time spent in MVPA & VPA used in the analyses
- Baseline, 6-weeks and 6-months post-intervention data collected
- Intervention occurred between March & July 2004
Method - Data Analyses

- Multilevel modeling (analysis) used to analyse data (MLwiN 1.10)
- Three level structure: follow-up measure (level 1), pupil (level 2) & school (level 3)
- Two analyses conducted:
  - Crude analysis: Effect of intervention when controlling for baseline physical activity and time
  - Adjusted analysis: Determine intervention effect when controlling for covariates identified a priori (age, sex, BMI, play duration, baseline physical activity, time)
- Intervention x time interaction term also constructed
- Separate analyses conducted for MVPA and VPA
Raw Score Results – MVPA

Baseline 6-weeks 6-months

Int Boy Con Boy Int Girl Con Girl

Research Institute for Sport & Exercise Sciences
FACULTY OF SCIENCE
Raw Score Results – VPA

Baseline 6-weeks 6-months

Int Boy Con Boy Int Girl Con Girl
## Results

<table>
<thead>
<tr>
<th></th>
<th>Crude Model</th>
<th>Adjusted Model</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>β (95% CI)</td>
<td>p-value</td>
</tr>
<tr>
<td>MVPA</td>
<td>5.68 (1.41, 9.96)</td>
<td>&lt;0.01***</td>
</tr>
<tr>
<td>VPA</td>
<td>2.47 (0.75, 4.19)</td>
<td>&lt;0.01***</td>
</tr>
<tr>
<td>Intervention x time</td>
<td>2.08 (-0.02, 4.18)</td>
<td>0.05*</td>
</tr>
</tbody>
</table>

* p < 0.1; ** p < 0.05; *** p < 0.01
Discussion

• Positive effect of intervention over time

• Intervention children engage in 4.5% and 2.3% more MVPA and VPA than control children respectively

• Intervention suitable stimulus for increasing and sustaining physical activity across time

• 4.5% increase = 3.5 mins/day, 17.5 mins/wk, ~11 ½ hrs/yr

• Intervention x time interaction for VPA

• VPA negatively related to body fat

• Intensity of physical activity may be important in the prevention of childhood obesity (Ruiz et al., 2006)
Discussion

- Physical environment, such as multicolor playground markings, associated with higher physical activity levels (Davison & Lawson, 2006).
- Present study lends support to this
- Children becoming accustomed to physical activity cues and opportunities provided
- Supportive physical environment influencing physical activity
- Recess - ideal non-curriculum opportunity to promote activity in school-aged children
Conclusion

• The results suggest that playground markings and physical structures are an effective method for significantly increasing and sustaining children's recess physical activity levels 6-months post-intervention.
Nicky Ridgers: n.ridgers@ljmu.ac.uk
Hierarchical Data Structure

School 1
- Pupil 1
  - T1
  - T2
  - T3
- Pupil 2
  - T1
  - T2
  - T3

School 2
- Pupil 1
  - T1
  - T2
  - T3
- Pupil 2
  - T1
  - T2
  - T3

School 3
- Pupil 1
  - T1
  - T2
  - T3
- Pupil 2
  - T1
  - T2
  - T3