Investigating the Impact of a Smart Growth Community on Children’s Physical Activity Contexts Using Ecological Momentary Assessment

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Smart Growth Planning Principles

1. A range of housing opportunities
2. Walkable neighborhoods
3. Community and stakeholder collaboration
4. Distinctive community with sense of place
5. Cost effective development decisions
6. Mixed land use
7. Preservation of open or green space
8. Variety of transportation choices
9. Development of existing communities
10. Compact building design (increased density)
Lack of Awareness of Available Environmental Resources

• Poor agreement between self-reported perceptions and objective assessment (GIS) of built environment (Kirtland et al., 2003).

• Mismatch is more common among:
  - Younger women
  - Low income and less educated individuals
  - People with low self-efficacy for physical activity, who are less active, who are overweight
  - People who had lived in their neighborhood for less than 2 years (Ball et al. 2008; Gebel et al., 2009; Reed, 2007)
Lack of Use of Available Environmental Resources

- Lack of time (Salmon et al., 2007)
- Lack of transportation (Hoefer et al., 2001)
- Lack of independent mobility (Irwin et al., 2007)
- Lack of safety (Carver et al., 2008)
- Lack of shade/vegetation
- High traffic volume

Availability ≠ Awareness ≠ Use
Ecological Momentary Assessment (EMA)

- Real-time responses in naturalistic settings
- Can simultaneously measure:
  1) Specific location (playground, trail, sidewalk)
  2) Perceived characteristics (safety, traffic, etc)
- Without recall bias
Research Goals

1) Determine whether the PA contexts of children living in a SG community differ from children living in conventional low-density suburban communities (control).

2) Determine whether 6-month changes in PA contexts lead to greater increases in PA for children living in the SG vs. control communities.
EMA Equipment

• Mobile phone (HTC Shadow, T-Mobile)
EMA Data Collection Platform

BSD-licensed open source mobile data collection tool developed for Windows Mobile devices using .NET CF 2 and Microsoft SQL Compact Edition.

(http://myexperience.sourceforge.net/)
EMA Prompting Schedule

- Two EMA waves (separated by 6 months).
- Monitoring occurred across 4 days (Fri-Mon) for each wave.
- No prompts during school hours on Fri or Mon.
- Children paid up to $40 ($20 for returning phone and $1 x 20 for each complete survey)

<table>
<thead>
<tr>
<th>Day</th>
<th>8:30-10am</th>
<th>10am-12pm</th>
<th>12-2pm</th>
<th>2-4pm</th>
<th>4-6pm</th>
<th>6-8pm</th>
<th>8-8:30pm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Friday</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Saturday</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Sunday</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Monday</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

Note: Question sequences were prompted at a random time within each interval.
Please stop what you are doing for a survey. Press the button under the word BEGIN to get started.

**Survey**

What were you **DOING** right before the beep went off? (Choose your main activity)
1. Reading, Computer, or Homework
2. Watching TV/Movies
3. Playing video games
4. Active Play, Sports, or Exercising
5. Other

**Survey**

What was this **OTHER** activity?
1. Eating/Drinking
2. Talking/On the phone
3. Chores
4. Riding in a car
5. Something else

**Survey**

WHERE were you just before the beep went off?
1. Home
2. School
3. Car/Van/Truck
4. Outdoors
5. Other

**Survey**

WHERE were you OUTDOORS just before the beep went off?
1. Park or Trail
2. Road
3. Sidewalk
4. Parking Lot
5. Other

**Survey**

WHERE was this **OTHER** place?
1. Restaurant
2. Store/Mall
3. Someone else's house
4. Gym/Rec center
5. Someplace else
EMA Items

WHERE were you at the PARK just before the beep went off?
1. ○ Playground
2. ○ Sports field
3. ○ Basketball/tennis court
4. ○ Picnic Area
5. ○ Beach
6. ○ Other

How many TREES AND PLANTS are there in the area where you are right now?
1. ○ No trees or plants
2. ○ Some trees and plants
3. ○ A lot of trees and plants

How much TRAFFIC is on the closest street to where you are right now?
1. ○ No traffic
2. ○ A little traffic
3. ○ A lot of traffic

How SAFE do you feel where you are right now?
1. ○ Unsafe
2. ○ Somewhat safe
3. ○ Very safe

How FAR are you from your home right now?
1. ○ At home
2. ○ A few blocks away
3. ○ More than a few blocks away

How did you get here?
1. ○ Walked
2. ○ Rode my bike
3. ○ Car/Van/Truck
4. ○ Bus/Subway/Train
Accelerometer

- Actigraph 7164 and GT2M (30-sec. epoch)
- Four days (Fri-Mon)
- MVPA ≥ 4 METs (Age-specific activity count thresholds)
- Meet PA recommendations = at least 60 min/day of MVPA
Results

- 120 children completed time 1 and 102 children completed time 2

- Of these, N = 94 (46 smart growth and 48 control with at least one EMA survey report of PA)

- Median residency (12 months SG and 96 months Control)

- Children responded to 78% of EMA prompts

- Accelerometer data unavailable (n = 3 time 1 and n = 8 time 2)
## Participants

<table>
<thead>
<tr>
<th></th>
<th>Smart Growth</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>46</td>
<td>48</td>
</tr>
<tr>
<td>Age</td>
<td>9-13 years (M = 10.9)</td>
<td>9-13 years (M = 11.0)</td>
</tr>
<tr>
<td>Sex</td>
<td>50% Male</td>
<td>54% Male</td>
</tr>
<tr>
<td>Ethnicity</td>
<td>33% Hispanic</td>
<td>31% Hispanic</td>
</tr>
<tr>
<td></td>
<td>22% White</td>
<td>31% White</td>
</tr>
<tr>
<td></td>
<td>15% African-Am.</td>
<td>2% African-Am.</td>
</tr>
<tr>
<td></td>
<td>13% Asian</td>
<td>6% Asian</td>
</tr>
<tr>
<td></td>
<td>17% Other</td>
<td>27% Other</td>
</tr>
<tr>
<td>Income</td>
<td>22% &lt; $45,000</td>
<td>29% &lt; $45,000</td>
</tr>
<tr>
<td></td>
<td>24% ≥ $100,000</td>
<td>21% ≥ $100,000</td>
</tr>
<tr>
<td>Weight Status</td>
<td>43% Overweight/At risk</td>
<td>21% Overweight/At risk</td>
</tr>
</tbody>
</table>
Outdoor Physical Activity Locations (by Group)

n = 60. Adj. Wald F = 2.90, df = 4, p = .026
Adjusted for sex, age, and annual household income.
Characteristics of Physical Activity Contexts - Vegetation (by Group)

- Vegetation (by Group)
  - 80%
  - 60%
  - 70%
  - 50%
  - 40%
- Physical Activity Reports
  - Outdoor Activity Reports
  - Percent of Outdoor Physical Activity Reports

n = 63. Adj. Wald F = 3.66, df = 1, p = .059
Adjusted for sex, age, and annual household income.
Characteristics of Physical Activity Contexts-
Distance from Home (by Group)

n = 81. Adj. Wald F = 13.43, df = 2, p < .001
Adjusted for sex, age, and annual household income.
Characteristics of Physical Activity Contexts - Transport Mode (by Group)

![Graph showing percentages of physical activity reports for walk, bike, and car by group.]

- Smart Growth: 90% (Walk), 60% (Bike), 20% (Car)
- Control: 10% (Walk), 80% (Bike), 90% (Car)

Adjusted for sex, age, and annual household income.
Home-Based Physical Activity (Group x Time)

N = 83. Adj. Wald F = 3.43, df = 1, p = .07
Adjusted for sex, age, annual household income, and days between assessment.
Characteristics of Physical Activity Contexts-Traffic (Group x Time)

n = 61. Adj. Wald F = 4.51, df = 1, p = .036
Adjusted for sex, age, annual household income, and days between assessments.
Meeting PA Recommendations (Group x Time)

n = 61. Adj. Wald F = 0.46, df = 1, p = .50
Adjusted for sex, age, annual household income, and days between assessments.
Limitations

• Not all PA captured (due to interval-contingent sampling).

• Missing data.

• Short monitoring period (4 days).

• Leisure-time only.
Conclusions

• PA contexts differ between children living in SG vs. Control communities.

• PA contexts showed little change over the 6 months of the study.
  - Children may have changed prior to enrolling.

• Differences in PA contexts did not lead to greater overall PA.
  - More than 6 months may be necessary to impact their behavior.
Acknowledgments

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- Ph.D Student: Yue Liao
- Project Manager: Keito Kawabata

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