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) To determine whether physical activity contexts differ between children living in a smart growth community vs. comparison communities.

2) To determine whether perceived vegetation, distance from home, travel mode and other characteristics of physical activity contexts differ.
<table>
<thead>
<tr>
<th></th>
<th>Smart Growth</th>
<th>Comparison</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>61</td>
<td>59</td>
</tr>
<tr>
<td>Age</td>
<td>11.00 (SD = 1.21)</td>
<td>11.03 (SD = 1.16)</td>
</tr>
<tr>
<td>Sex</td>
<td>46% Male</td>
<td>58% Male</td>
</tr>
<tr>
<td>Ethnicity</td>
<td>30% Hispanic 18% White 18% African-Am. 14% Asian 5% Other</td>
<td>35% Hispanic 29% White 2% African-Am. 17% Asian 7% Other</td>
</tr>
<tr>
<td>Income</td>
<td>23% &lt; $45,000 25% ≥ $100,000</td>
<td>27% &lt; $45,000 22% ≥ $100,000</td>
</tr>
<tr>
<td>Weight Status</td>
<td>42% Overweight/At risk</td>
<td>33% Overweight/At risk</td>
</tr>
</tbody>
</table>
EMA Equipment/Protocol

- Mobile phone (HTC Shadow, T-Mobile)
- Monitoring occurred across 4 days (Fri-Mon).
- No prompts during school hours on Friday or Monday.
- 3-7 randomly-spaced prompts each day (20 total).
- Reminder prompt after 5 min for missed entry.
- Each item appeared in a randomly programmed 60% of surveys (but main activity item every time).
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: 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**

**Survey**
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

**Survey**
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

**Survey**
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

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

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

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

• Actigraph GT2M (30-sec. epoch).

• Time-stamped and linked with EMA survey data.

• Outcome variables (± 15-min. of EMA prompt)
  (1) Steps
  (2) MVPA min.

• MVPA ≥ 4 METs (1,952 activity counts/min.)
Results

- Children responded to 73.5% or M = 14.7 (SD = 4.1) EMA prompts.
- Accelerometer data lost for n = 9.
- Physical activity (i.e., active play, sports, or exercise) was reported as the main activity in 17% (291 of 1,749) of EMA responses.
- n = 97 had at least one report of physical activity.
Physical Activity Contexts by Group (Girls)

n = 31 children (63 survey responses)
Adjusted for day of the week, time of day, household income.
n = 43 children (65 survey responses)
Adjusted for day of the week, time of day, household income.
Characteristics of Physical Activity Contexts by Group (Vegetation)

n = 47 children (77 survey responses) Adjusted for day of the week, time of day, household income.
Characteristics of Physical Activity Contexts by Group (Distance from Home)

- **Yard**: Smartgrowth - 20%, Comparison - 30%
- **< a few blocks**: Smartgrowth - 45%, Comparison - 35%
- **> a few blocks**: Smartgrowth - 60%, Comparison - 50%

n = 76 children (138 survey responses)
Adjusted for day of the week, time of day, household income.
Characteristics of Physical Activity Contexts by Group (Transport Mode) (Ages 9-11)

n = 36 children (60 survey responses)
Adjusted for day of the week, time of day, household income.
Summary

Children living in a Smart Growth community report:

• More outdoor (and less home-based) physical activity (especially girls).
• More park-based physical activity.
• More vegetation at physical activity locations.
• More physical activity < a few blocks of home.
• More walking to physical activity locations (especially 9-11 year-olds).
Physical Activity Levels by Group
(± 15-min. of EMA prompt)

<table>
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<tr>
<th></th>
<th>Steps</th>
<th>MVPA min.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smart Growth</td>
<td>513.20 (SE = 44.06)</td>
<td>3.73 (SE = 0.45)</td>
</tr>
<tr>
<td>Comparison</td>
<td>479.24 (SE = 41.89)</td>
<td>3.33 (SE = 0.44)</td>
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n = 90 children (260 survey responses)
Adjusted for day of the week, time of day, household income.
Limitations

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

• Missing data.

• Short monitoring period (4 days).

• Leisure-time only.
Implications/Future Directions

• Determine whether physical activity contexts change as a function of length of residency in smart growth community.

• Examine physical activity contexts in relation to objective environmental measures (IM audit and GIS).
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