Perceptions of the Physical Environment Surrounding Schools & Physical Activity among Low-income, Urban, African American Adolescent Girls

Erin Hager, PhD
Candice Gormley, BS
Laura Latta, MHS
M. Reese Pepper, RD, PhD
Dawn Witherspoon, PhD
Maureen Black, PhD
Background

• Low-income, urban, African American adolescent girls experience low rates of PA and high rates of obesity

• Positive perceptions of the physical environment near the homes of adolescent girls have been associated with higher levels of PA*
Background

• Low-income, urban, African American adolescent girls experience low rates of PA and high rates of obesity

• Positive perceptions of the physical environment near the homes of adolescent girls have been associated with higher levels of PA*

*Evenson 2007, Voorhees, 2010

Examining whether perceptions of the physical environment surrounding schools are associated with PA could have important policy implications
Objective

• To examine the relationship between adolescent girls’ perceptions of the physical environment surrounding their schools and their objectively measured physical activity

  – Hypothesis: adolescent girls with a positive perception of the environment surrounding their school will be more active than girls with a less positive perception
Conceptual Framework: Ecological Model of Active Living

Policy Environment

Behavior Settings: Access and Characteristics

Behavior: Active Living Domains

Perceived Environment

Intrapersonal

Sallis et al, 2006
Conceptual Framework: Ecological Model of Active Living

Sallis et al, 2006
Conceptual Framework: Ecological Model of Active Living

Policy Environment

Behavior Settings: Access and Characteristics

Behavior: Active Living Domains

- Active Recreation
- Active Transport

Perceived Environment

Intrapersonal

Sallis et al, 2006
Conceptual Framework: Ecological Model of Active Living

Policy Environment

Behavior Settings: Access and Characteristics

Behavior: Active Living Domains

- Active Recreation
- Active Transport
- Perceived Environment
- Intrapersonal

Minutes in MVPA

Sallis et al, 2006
Conceptual Framework: Ecological Model of Active Living

- Policy Environment
- Behavior Settings: Access and Characteristics
- Behavior: Active Living Domains
  - Active Recreation
  - Active Transport
  - Perceived Environment
  - Intrapersonal
- Minutes in MVPA

Sallis et al, 2006
Methods

Recruitment: Challenge! in Schools

• School-Level Inclusion Criteria
  – Within 7 miles of a YMCA
  – >75% of the students receive free/reduced priced lunch
  – >70% of the students African American

• Individual-Level Inclusion Criteria
  – 6th or 7th grade girl
  – Able to engage in physical activity (~PE class)
  – No weight criteria
Methods

**Physical Activity: Accelerometry**
- Actical (Philips Respironics, Inc.)
- Worn on the ankle for ≥7 consecutive days
- First and last days truncated
- Minutes in moderate-vigorous physical activity (MVPA) determined using a validated cut-off of 3200 counts/minute

**Body composition:**
- Calculated BMI-for-age percentiles from height and weight (measured in ≥duplicate)
Methods

Perception of the Physical Environment Around the School:
10-item questionnaire (Evenson et al. 2007)
• Safety, aesthetics, and access to physical activity facilities
• Changed “near your home” to “near your school”
• Questionnaires administered using audio enhanced computer-assisted software
• Scoring:
  – Individual items
  – Factor Analysis: 7-item mean score
  – Dichotomized schools by median score (high positive versus low positive)

Analysis Plan:
• Spearman correlations and T-tests
• Multi-level modeling
**Methods**

**Active Neighborhood Checklist**  
(Hoehner, 2007)

- Driving audit with trained auditors
- Modifications included adding counts of physical activity facilities and food stores
- 16 segments were surveyed ($\frac{1}{4} \times \frac{1}{4}$ mile each) per school, extending $\frac{1}{2}$ mile from the school in a 4x4 grid pattern
- Categories included: (1) mixed land use, (2) quality of environment for pedestrians, and (3) walkability/bicycle friendly
Methods

Active Neighborhood Checklist
(Hoehner, 2007)

• Driving audit with trained auditors

• Modifications included adding counts of physical activity facilities and food stores

• 16 segments were surveyed ($\frac{1}{4} \times \frac{1}{4}$ mile each) per school, extending $\frac{1}{2}$ mile from the school in a 4x4 grid pattern

• Categories included: (1) mixed land use, (2) quality of environment for pedestrians, and (3) walkability/bicycle friendly
425 6th and 7th grade girls recruited
↓
290 randomized to receive an accelerometer
↓
239 with valid accelerometry data
↓
224 had complete data on perceptions of the environment
# Results:

## Sample Description

<table>
<thead>
<tr>
<th>Sample Description</th>
<th>% or Mean (range)</th>
</tr>
</thead>
<tbody>
<tr>
<td>% 6th grade</td>
<td>55.4%</td>
</tr>
<tr>
<td>Age (years)</td>
<td>12.1 (10.1-14.4)</td>
</tr>
<tr>
<td>% Black or African American</td>
<td>84.2%</td>
</tr>
<tr>
<td>% Overweight or Obese</td>
<td>44.6%</td>
</tr>
<tr>
<td>MVPA (minutes/day)</td>
<td>35.4 (0-104.5)</td>
</tr>
<tr>
<td>% Meeting Recommended 60 min/day MVPA</td>
<td>11.6%</td>
</tr>
<tr>
<td>Distance to School (miles)</td>
<td>1.9 (0.03-9.0)</td>
</tr>
</tbody>
</table>
## Results:

Perceptions of the environment surrounding the school

<table>
<thead>
<tr>
<th>7-item scale</th>
<th>% Agree*</th>
</tr>
</thead>
<tbody>
<tr>
<td>There are sidewalks on most streets near my school</td>
<td>86.2%</td>
</tr>
<tr>
<td>There are bicycle or walking trails near my school</td>
<td>42.4%</td>
</tr>
<tr>
<td>It is safe to walk or jog near my school</td>
<td>43.8%</td>
</tr>
<tr>
<td>Walkers and bikers on the streets near my school can easily be seen by people in their homes</td>
<td>52.2%</td>
</tr>
<tr>
<td>I often see other girls or boys playing outside around my school</td>
<td>73.7%</td>
</tr>
<tr>
<td>There are many interesting things to look at while walking near my school</td>
<td>48.2%</td>
</tr>
<tr>
<td>The streets near my school are well lit at night</td>
<td>37.9%</td>
</tr>
</tbody>
</table>

*"agree a little” or “agree a lot"
## Results:

### Perceptions of the environment surrounding the school

<table>
<thead>
<tr>
<th>Perception</th>
<th>% Agree*</th>
</tr>
</thead>
<tbody>
<tr>
<td>There are many places I can go within walking distance of my school</td>
<td>47.3%</td>
</tr>
<tr>
<td>There is so much traffic that it makes it hard to walk near my school</td>
<td>25.9%</td>
</tr>
<tr>
<td>There is a lot of crime near my school</td>
<td>21.9%</td>
</tr>
</tbody>
</table>

*“agree a little” or “agree a lot”*
Results:
Multi-Level Models

• **Outcome:** minutes engaging in MVPA, adjusting for school (level 1) and teen age, overweight/obese status, distance from home to school, and number of days wearing accelerometer (level 2)
Results: Multi-Level Models

• Outcome: minutes engaging in MVPA, adjusting for school (level 1) and teen age, overweight/obese status, distance from home to school, and number of days wearing accelerometer (level 2)

  – 7-item summary score:
    • $\beta=1.50, p=0.370$
Results:
Multi-Level Models

• Outcome: minutes engaging in MVPA, adjusting for school (level 1) and teen age, overweight/obese status, distance from home to school, and number of days wearing accelerometer (level 2)

  – 7-item summary score:
    • $\beta=1.50$, $p=0.370$

  – Individual Items:
    • There are many places I can go within walking distance of my school: $\beta=5.8$, $p=0.041$ (agree versus disagree)
Results:
“Low-Positive” versus “High-Positive” Schools

- Median = 3.57
- Mean of “High Positive” perception schools (n=6) = 3.8
- Mean of “Low Positive” perception schools (n=6) = 3.3
- t = 5.2 (p < 0.001)
Results:
“Low-Positive” versus “High-Positive” Schools

• Multi-Level Model, outcome: minutes engaging in MVPA, adjusting for school (level 1) and teen age, overweight/obese status, distance from home to school, and number of days wearing accelerometer (level 2)
  – $\beta=-6.5$, $p=0.040$
Results:

“Low-Positive” versus “High-Positive” Schools

- Multi-Level Model, outcome: minutes engaging in MVPA, adjusting for school (level 1) and teen age, overweight/obese status, distance from home to school, and number of days wearing accelerometer (level 2)
  - $\beta=-6.5$, $p=0.040$

<table>
<thead>
<tr>
<th></th>
<th>“Low-Positive” Perception Schools</th>
<th>“High-Positive” Perception Schools</th>
<th>$t$ (p)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minutes in MVPA</td>
<td>38.34</td>
<td>30.99</td>
<td>0.004</td>
</tr>
<tr>
<td>Distance from home to school (miles)</td>
<td>1.51</td>
<td>2.61</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Age (years)</td>
<td>12.3</td>
<td>11.9</td>
<td>0.001</td>
</tr>
</tbody>
</table>
## Results:

Built Environment: ½ mile surrounding school

<table>
<thead>
<tr>
<th></th>
<th>“Low-Positive” Perception Schools</th>
<th>“High-Positive” Perception Schools</th>
</tr>
</thead>
<tbody>
<tr>
<td>Graffiti or Broken Windows*</td>
<td>2.9</td>
<td>0.9</td>
</tr>
<tr>
<td>Abandoned homes or buildings*</td>
<td>2.5</td>
<td>0.5</td>
</tr>
<tr>
<td># Food Sources</td>
<td>5.8</td>
<td>4.0</td>
</tr>
<tr>
<td># Fitness Facilities</td>
<td>3.8</td>
<td>5.4</td>
</tr>
<tr>
<td>Parks*</td>
<td>0.1</td>
<td>0.8</td>
</tr>
</tbody>
</table>

*present in segment
Results:
Built Environment: ½ mile surrounding school

<table>
<thead>
<tr>
<th>Built Environment Feature</th>
<th>&quot;Low-Positive&quot; Perception Schools</th>
<th>&quot;High-Positive&quot; Perception Schools</th>
<th>Correlation r(p) Perception Score</th>
<th>Minutes in MVPA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Graffiti or Broken Windows*</td>
<td>2.9</td>
<td>0.9</td>
<td>-.21 (.002)</td>
<td>.15 (.026)</td>
</tr>
<tr>
<td>Abandoned homes or buildings*</td>
<td>2.5</td>
<td>0.5</td>
<td>-.18 (.008)</td>
<td>.14 (.035)</td>
</tr>
<tr>
<td># Food Sources</td>
<td>5.8</td>
<td>4.0</td>
<td>ns</td>
<td>.20 (.002)</td>
</tr>
<tr>
<td># Fitness Facilities</td>
<td>3.8</td>
<td>5.4</td>
<td>.15 (.029)</td>
<td>.16 (.018)</td>
</tr>
<tr>
<td>Parks*</td>
<td>0.1</td>
<td>0.8</td>
<td>.23(&lt;.001)</td>
<td>ns</td>
</tr>
</tbody>
</table>

*present in segment
## Results:
Built Environment: $\frac{1}{2}$ mile surrounding school

<table>
<thead>
<tr>
<th></th>
<th>“Low-Positive” Perception Schools</th>
<th>“High-Positive” Perception Schools</th>
<th>Correlation $r(p)$</th>
<th>Minutes in MVPA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grafitti or Broken Windows*</td>
<td>2.9</td>
<td>0.9</td>
<td>-.21 (.002)</td>
<td>.15 (.026)</td>
</tr>
<tr>
<td>Abandoned homes or buildings*</td>
<td>2.5</td>
<td>0.5</td>
<td>-.18 (.008)</td>
<td>.14 (.035)</td>
</tr>
<tr>
<td># Food Sources</td>
<td>5.8</td>
<td>4.0</td>
<td>ns</td>
<td>.20 (.002)</td>
</tr>
<tr>
<td># Fitness Facilities</td>
<td>3.8</td>
<td>5.4</td>
<td>.15 (.029)</td>
<td>.16 (.018)</td>
</tr>
<tr>
<td>Parks*</td>
<td>0.1</td>
<td>0.8</td>
<td>.23(&lt;.001)</td>
<td>ns</td>
</tr>
</tbody>
</table>

*present in segment
Results:
Built Environment: \( \frac{1}{2} \) mile surrounding school

<table>
<thead>
<tr>
<th>Perception</th>
<th>Correlation r(p)</th>
<th>Perceived Schools</th>
<th>Correlation r(p)</th>
<th>Perceived Schools</th>
</tr>
</thead>
<tbody>
<tr>
<td>Graffiti or Broken Windows*</td>
<td></td>
<td>2.9</td>
<td>0.9</td>
<td>-.21 (.002)</td>
</tr>
<tr>
<td>Abandoned homes or buildings*</td>
<td></td>
<td>2.5</td>
<td>0.5</td>
<td>-.18 (.008)</td>
</tr>
<tr>
<td># Food Sources</td>
<td></td>
<td>5.8</td>
<td>4.0</td>
<td>ns</td>
</tr>
<tr>
<td># Fitness Facilities</td>
<td></td>
<td>3.8</td>
<td>5.4</td>
<td>.15 (.029)</td>
</tr>
<tr>
<td>Parks*</td>
<td></td>
<td>0.1</td>
<td>0.8</td>
<td>.23(&lt;.001)</td>
</tr>
</tbody>
</table>

*present in segment
Conclusions

• Girls attending schools with more positive perceptions of the physical environment around the schools were significantly less active compared to girls with less positive perceptions
  – Did not support our hypothesis
  – Positive perceptions of physical environments surrounding schools may not be enough to encourage activity in urban environments to the extent that they may in suburban environments

• Both perceptions of having “places” to go within walking distance of the school and measured number of food stores/fitness facilities were positively related to PA
Strengths & Limitations

Strengths:
• Population
• Combination of methods: perceived and objective

Limitations:
• Not generalizable to other populations/geographic areas
• Other data of interest not included: crime, parent perceptions
Policy Implications

• Policy makers have the ability to enact zoning laws near public schools that could influence the built environment
Next Steps…

Overall:
• Identify positive factors in urban neighborhoods around schools that are related to physical activity among adolescent girls

Challenge! in Schools data:
• Examine how neighborhood environment surrounding schools is associated with:
  – Obesity
  – Diet
• Utilize GIS mapping to examine the relationship between activity, diet, obesity and the home/school neighborhood environments
Acknowledgements

Funders:
Challenge! in Schools:
- National Institutes of Health, National Institute for Child Health and Development (Black)
- Robert Wood Johnson Foundation, Active Living Research/New Connections (Hager)
- Thomas Wilson Sanitarium for Children of Baltimore City (Hager)

Investigators
UMSOM: Maureen Black, PhD; Erin Hager, PhD; Soren Snitker, PhD; Larry Magder, PhD; Yan Wang, PhD
JHSPH: Joel Gittelsohn, PhD
UMBC: Carlo DiClemente, PhD
UMES: Margarita Treuth, PhD
UMA: Jean Anliker, PhD

Challenge! In Schools Team
Growth and Nutrition Division
Thank you

Erin R. Hager, Ph.D.
ehager@peds.umaryland.edu
www.medschool.umaryland.edu/growth
<table>
<thead>
<tr>
<th>Statement</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>There are many places I can go within walking distance of my school</td>
<td>.383</td>
<td>-.104</td>
<td>.793</td>
</tr>
<tr>
<td>There are sidewalks on most streets near my school</td>
<td>.482</td>
<td>.097</td>
<td>.055</td>
</tr>
<tr>
<td>There are bicycle or walking trails near my school</td>
<td>.545</td>
<td>.063</td>
<td>.158</td>
</tr>
<tr>
<td>It is safe to walk or jog near my school</td>
<td>.636</td>
<td>.381</td>
<td>-.028</td>
</tr>
<tr>
<td>Walkers and bikers on the streets near my school can easily be seen by</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>people in their homes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>There is so much traffic that it makes it hard to walk near my school</td>
<td>-.102</td>
<td>.756</td>
<td>-.025</td>
</tr>
<tr>
<td>There is a lot of crime near my school</td>
<td>.170</td>
<td>.726</td>
<td>-.100</td>
</tr>
<tr>
<td>I often see other girls or boys playing outside around my school</td>
<td>.460</td>
<td>-.320</td>
<td>-.553</td>
</tr>
<tr>
<td>There are many interesting things to look at while walking near my school</td>
<td>.630</td>
<td>-.221</td>
<td>.063</td>
</tr>
<tr>
<td>The streets near my school are well lit at night</td>
<td>.653</td>
<td>-.003</td>
<td>-.175</td>
</tr>
</tbody>
</table>