Perceptions of Neighborhood Park Quality: Associations with Physical Activity and BMI

Hua Bai, Sonja A. Wilhelm Stanis, PhD, Andrew T. Kaczynski, PhD, Gina M. Besenyi, MPH
Background

- Parks are increasingly recognized as an important component of the built environment for physical activity
  - Low-cost
  - Available to a majority of population across ages, cultures, ethnicities, genders, income levels and abilities

(Bedimo-Rung et al., 2005; Cohen et al., 2007; Vinluan, 2005).
Park characteristics and PA

- **Objective measures (audits, GIS):**
  - Park proximity
  - Park size
  - Neighborhood environment
  - Access to parks
  - Availability of certain park facilities (e.g., wooded areas, trails, & paths)
    (e.g., Cohen et al., 2010; Coombes et al., 2010; Giles-Corti et al., 2005; Kaczynski et al., 2008; Saelens et al., 2006)

- **Self-reported perceptions may be an equally viable and important method to understand how environmental factors influence active living**
  (Brownson et al., 2009)
Subjective measures (interview, questionnaire):

- Perceived accessibility
- Perceived availability of facilities
- *Perceived quality*
  - Perceived safety
  - Perceived availability of facilities
  - Perceived attractiveness
  - Perceived maintenance and condition of facilities
  - Perceived use

(e.g., Babey et al., 2008; Humpel et al., 2002; Ries et al., 2009; Romero, 2005)

Few studies have examined park quality comprehensively and some only looked at the relationship with park use rather than PA and health outcomes.
Study Purpose and Objectives

- The purpose of this study was to investigate the relationship between residents’ perceptions of park quality in their neighborhood and their moderate and vigorous PA, park-based PA, and body mass index (BMI).

- A secondary objective was to examine the test-retest reliability of a newly developed neighborhood park quality scale.
Methods

❖ Sample selection
  • 60 parks geographically dispersed across Kansas City, Missouri
  • 66 randomly selected households within ½ mile of each park
  • N=66*60=3906

❖ Data collection
  • Self-administered, Mailed questionnaire
  • October through December of 2010
  • Modified Dillman (2008) protocol:
    - An initial questionnaire
    - A thank you/reminder postcard
    - Three waves of follow-up questionnaires
    - Short retest questionnaire (72/150, 48.0% response rate)

❖ Response rate: n=893; 27.4%
  • Comparable to other similar studies with response rates ranging from 21-34% (e.g., Coombe et al., 2010; Tilt, 2010)
Study Instrument
11 pages long

<table>
<thead>
<tr>
<th>Variables</th>
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<tbody>
<tr>
<td>Perceived park quality</td>
<td></td>
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  - 11 pages long

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<th>Variables</th>
<th>5-point scale (1= strongly disagree, 3= neither, 5= strongly agree)</th>
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<td><strong>Perceived park quality</strong></td>
<td>7 items:</td>
</tr>
<tr>
<td>Physical activity</td>
<td></td>
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<td></td>
<td>• Maintenance</td>
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<td>• Benefits to the neighborhood (adapted from Ries et al., 2009)</td>
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- Demographics
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</tr>
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<td>Physical activity</td>
<td>✓ How many days per week &amp; total time per day participated in physical activity at respectively moderate /vigorous intensity level for at least 10 minutes at a time. (BRFSS; CDC 2009)</td>
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  - Park-based weekly PA:
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  - Time (hours & minutes) spent being physically active during last visit to a park.
  - (Walker et al., 2009)
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<th>Race/ethnicity</th>
<th>Household income</th>
<th>BMI (self-report height &amp; weight)</th>
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### Demographics

- Past park use
**Variables**

| Perceived park quality       | ✓ If had visited a park within the last month  |
|                             | No-> non-visitor       Yes-> visitor           |
| Physical activity           | ✓ If yes, respondents indicated how many days they visited a park in the last month |
| Moderate general            | ✓ Median split-> frequent and occasional visitor |
| Vigorous general            | ✓ - Non visitors       |
| Park-based                  | ✓ - Occasional visitors |
| Demographics                | ✓ - Frequent visitors  |

Past park use
Data Analysis and results

- Descriptive Statistics
- Park Quality Scale Reliability
  - Interclass Correlations (ICCs)
  - Cronbach’s alpha
- Ordinal Regression
  - IVs of ordinal regression models:
    - Neighborhood park quality (7 items)
  - DVs of ordinal regression models:
    - Model 1: Moderate PA
    - Model 2: Vigorous PA
    - Model 3: Park-based weekly PA
    - Model 4: Park-based PA during last visit
    - Model 5: BMI
*Controlling for past park use & demographics
Respondent characteristics

**Gender**
- Male: 39%
- Female: 61%

**Annual Household Income**
- $100,000-$149,999: 10%
- $75,000-$99,999: 19%
- $50,000-$74,999: 11%
- $25,000-$49,999: 31%
- less than $25,000: 25%
- $150,000 or more: 4%

**Race/Ethnicity**
- White: 67%
- Black: 24%
- Hispanic/Latino: 5%
- Other: 2%
- Asian: 2%

**Age**
- 18-38 years old: 27%
- 39-50 years old: 24%
- 51-63 years old: 25%
- 64 years old or older: 24%

**M** = 50.9, **SD** = 16.5
Respondent characteristics

General Physical Activity

- Meet recommendation: 54%
- No PA: 16%
- Insufficient PA: 15%
- Cannot determine: 15%

Past Park Use in the Last Month

- Non-visitors: 58%
- Occasional visitors: 20%
- Frequent visitors: 22%

BMI

- Normal weight: 37%
- Overweight: 36%
- Obese: 25%
- Underweight: 2%

Body Mass Index (n = 834)

- 0%
Perceptions of park quality

- Test-retest ICCs of the neighborhood park quality questions ranged from 0.49 to 0.76, indicating moderate to substantial agreement (Landis & Koch, 1977).

- The set of 7 items displayed high internal reliability (α=.91).

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<th>Mean</th>
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<td>A benefit to the neighborhood</td>
<td>662</td>
<td>3.85</td>
<td>0.99</td>
</tr>
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<td>Cleanliness</td>
<td>662</td>
<td>3.70</td>
<td>0.92</td>
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<td>How well used the parks are</td>
<td>659</td>
<td>3.58</td>
<td>1.05</td>
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<td>Maintenance</td>
<td>649</td>
<td>3.53</td>
<td>1.00</td>
</tr>
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<td>Attractiveness</td>
<td>656</td>
<td>3.50</td>
<td>1.01</td>
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<td>Safety</td>
<td>658</td>
<td>3.45</td>
<td>1.04</td>
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<td>Availability of facilities of interest</td>
<td>657</td>
<td>3.21</td>
<td>1.10</td>
</tr>
<tr>
<td>Overall (α=.91)</td>
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<td>3.55</td>
<td>0.81</td>
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### Ordinal regressions models of park qualities on PA measures

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<td>607.92</td>
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<td>Pseudo R² (Nagelkerke)</td>
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<th>Independent Variables - Odds Ratio (95% CI)</th>
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<th>Used by many people</th>
<th>Well-maintained</th>
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<td>0.95 (0.77-1.16)</td>
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<td>1.07 (0.79-1.43)</td>
<td>0.81 (0.65-1.01)</td>
<td><strong>1.45</strong> (1.02-2.06)</td>
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Note: * p < .05; **p < .01; ***p < 001
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Note: * $p < .05$; **$p < .01$; ***$p < .001$
Perception of seeing parks as a neighborhood benefit

- Rated highest
- Has a strong association with increased vigorous and park-based PA and decreased BMI.

Promoting positive attitudes and helping residents understand the numerous benefits of local parks may help promote PA and well-being.
## Ordinal regressions models of park qualities on PA measures

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- **Cleanliness**

  - Cleanliness is negatively related with park-based PA
  - Contrary to a previous finding that cleaner park/facilities increase use (Gobster, 2002). However, that study didn’t examine the relationship with PA.

  ➡️ More frequent active users of parks may be more cognizant of park incivilities (e.g., vandalism; Ibitayo & Virden, 1996)
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<td>0.78 (0.56-1.09)</td>
<td>1.00 (0.82-1.21)</td>
</tr>
</tbody>
</table>

Note: * p < .05; **p < .01; ***p < .001
How well used the parks are

- Greater perceived park use levels were found to be associated with higher BMI
- Contrary to some studies that surroundings with many people exercising encourage PA participation (Brownson et al., 2001)

➤ Popular parks may be viewed as places for more sedentary social gatherings such as picnics

➤ Perceptions of crowded parks discourage use for PA

(Arnberger & Brandenburg, 2007; Brunt & Courtney, 1999)
Ordinal regressions models of park qualities on PA measures

<table>
<thead>
<tr>
<th>Dependent Variable Models</th>
<th>Moderate PA</th>
<th>Vigorous PA</th>
<th>Park-based weekly PA</th>
<th>Park-based PA during last visit</th>
<th>BMI</th>
</tr>
</thead>
<tbody>
<tr>
<td>-2 Log Likelihood</td>
<td>1449.24</td>
<td>1295.51*</td>
<td>911.18***</td>
<td>607.92</td>
<td>1204.72*</td>
</tr>
<tr>
<td>Pseudo R² (Nagelkerke)</td>
<td>0.02</td>
<td>0.04</td>
<td>0.09</td>
<td>0.06</td>
<td>0.03</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Independent Variables – Odds Ratio (95% CI)</th>
<th>A benefit to the neighborhood</th>
<th>Clean</th>
<th>Used by many people</th>
<th>Well-maintained</th>
<th>Attractive</th>
<th>Safety</th>
<th>Facilities that I am interested in</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.78 (0.60-1.00)</td>
<td>1.13 (0.85-1.51)</td>
<td>0.94 (0.76-1.15)</td>
<td>1.17 (0.88-1.57)</td>
<td>1.12 (0.85-1.47)</td>
<td>0.86 (0.69-1.07)</td>
<td>0.95 (0.77-1.16)</td>
</tr>
<tr>
<td></td>
<td>0.71* (0.55-0.92)</td>
<td>1.07 (0.79-1.43)</td>
<td>0.81 (0.65-1.01)</td>
<td>1.03 (0.73-1.46)</td>
<td>0.97 (0.73-1.30)</td>
<td>0.91 (0.72-1.16)</td>
<td>1.06 (0.86-1.31)</td>
</tr>
<tr>
<td></td>
<td>0.71* (0.53-0.96)</td>
<td>1.45* (1.02-2.06)</td>
<td>0.84 (0.65-1.08)</td>
<td>1.70 (1.19-2.43)</td>
<td>0.93 (0.66-1.31)</td>
<td>0.84 (0.63-1.11)</td>
<td>0.86 (0.66-1.12)</td>
</tr>
<tr>
<td></td>
<td>0.85 (0.58-1.26)</td>
<td>1.41 (0.87-2.29)</td>
<td>1.70 (1.19-2.43)</td>
<td>0.96 (0.62-1.50)</td>
<td>0.75 (0.44-1.27)</td>
<td>1.00 (0.70-1.43)</td>
<td>0.78 (0.56-1.09)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.45** (1.14-1.84)</td>
<td></td>
<td>1.11 (0.83-1.47)</td>
<td>1.11 (0.85-1.45)</td>
<td>1.11 (0.83-1.47)</td>
<td>1.00 (0.82-1.21)</td>
</tr>
</tbody>
</table>

Note: *p < .05; **p < .01; ***p < .001
Maintenance, attractiveness, safety and availability of facilities of interest

- No significant relationship with physical activity and BMI was found

Objective measures in addition to self-report data

Ex: crime rate, traffic accidents rate, appearance of emergency telephone, and lightning to measure safety (e.g., Coen & Ross, 2006; Foster & Giles-Corti, 2008)
Limitations and future research

• Only measured perceptions of in-park quality aspects of park characteristics
  - Future research could include characteristics of access & policies
• Challenges of self-reported measure of PA (e.g., recall accuracy)
  - Future research could include objective measures of PA
• Given the demonstrated reliability of the neighborhood park quality scale
  - Future research could examine residents’ perceptions
  - Further understanding disparities in perceptions of neighborhood park quality
Conclusion

- Remains a need to promote PA and health
  - About 50% of respondents meet PA recommendation levels
  - Over 60% pertain to overweight and obese
- Park quality is important to PA and health
  - Residents’ perceptions of their neighborhood park quality are related to vigorous PA, park-based PA and BMI
  - Enhancing the awareness of benefits of parks by residents can help promote PA and community’s health
Team:
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Dr. Andrew Kaczynski, University of South Carolina, Co-PI
Hua Bai, University of Missouri
Gina M. Besenyi, MPH, Kansas State University
Katherine B. Vaughan, MPH, Kansas State University

Thank you!
Physical activity and health

<table>
<thead>
<tr>
<th>PA and Health Variables (in minutes)</th>
<th>n</th>
<th>%</th>
<th>Mean (Std.)</th>
<th>Median</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Body Mass Index (n = 834)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Underweight (BMI&lt;18.5)</td>
<td>12</td>
<td>1.4%</td>
<td>27.3 (5.9)</td>
<td>26.4</td>
</tr>
<tr>
<td>Normal weight (18.5&lt;BMI&lt;25)</td>
<td>312</td>
<td>37.4%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overweight (25&lt;BMI&lt;30)</td>
<td>301</td>
<td>36.1%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Obese (BMI&gt;30)</td>
<td>209</td>
<td>25.1%</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Moderate PA (n = 748)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No moderate PA</td>
<td>164</td>
<td>21.9%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Participate in Moderate PA</td>
<td>584</td>
<td>78.1%</td>
<td>349.8 (541.2)</td>
<td>180.0</td>
</tr>
<tr>
<td><strong>Vigorous PA (n = 783)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No vigorous PA</td>
<td>425</td>
<td>54.3%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Participate in Vigorous PA</td>
<td>358</td>
<td>45.7%</td>
<td>247.0 (442.8)</td>
<td>120.0</td>
</tr>
<tr>
<td><strong>Park-based weekly PA (n = 460)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No park-based PA</td>
<td>253</td>
<td>55.0%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Participate in park-based PA</td>
<td>207</td>
<td>45.0%</td>
<td>166.5 (298.5)</td>
<td>120.0</td>
</tr>
<tr>
<td><strong>Park-based PA during last visit (n = 287)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No park-based PA during last visit</td>
<td>29</td>
<td>10.1%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Participate in park-based PA</td>
<td>258</td>
<td>89.9%</td>
<td>77.1 (98.6)</td>
<td>60.0</td>
</tr>
</tbody>
</table>