Associations of Perceived Neighborhood Attributes with Self-Report and Objective Measures of Walking in Hong Kong Adults: Preliminary Findings

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Background

- Health and walking
- Environment and walking
- Most research conducted in low-density urbanized areas of Western countries (Australia; Canada; USA)

- Asian urban areas:
  - Higher density
  - Greater reliance on public transport
  - Socio-cultural differences
  - Differences in the built environment
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What does a high density, walkable neighborhood look like?

Hong Kong
Average pop. density 6295 persons/km²

Adelaide, Australia
Average pop. density 1687 persons/km²
Aim

- Examine relationships of perceived neighborhood characteristics with self-report and objective measures of walking in Chinese-speaking adults of Hong Kong
  - Self-reported walking within (& outside) the neighborhood
  - Moderate-intensity minutes of physical activity (accelerometers)
  - Step counts (accelerometers)

- Provide data for the International Physical Activity and the Environment Network initiative (Hong Kong representing the upper end of urban density spectrum)
Methods

• N = 195 (aged 20-65) – multi-stage stratified sampling strategy

• 32 small Tertiary Planning Unit groups in Hong Kong metropolitan area
  – High SES and high walkability
  – High SES and low walkability
  – Low SES and high walkability
  – Low SES and low walkability

Walkability (GIS) = dwelling density + street connectivity
Types of neighborhood

HWHSES: Tsan Yung Mansion

LWHSES: Discovery Bay
Midvale Village

HWHSES: Tai Fung House

LWLSES: Wing On Terrace
Methods

• Interviewer-administered questionnaire
  – Perceived attributes of local community
    • Chinese Neighborhood Environment Walkability Scale
      – Abbreviate (NEWS-AC)
        • Man-made barriers (car parked on sidewalks; hawkers; crowd)
        • Indoor places for walking
        • Non-direct access to services (through bridges; escalators)
        • Air pollution
      – Weekly minutes of walking for transport and recreation within and outside the neighborhood (NPAQ-C) (Giles-Corti et al., 2006)
      – Other (e.g., socio-demographics)
    • Accelerometers (Actigraph GT1M); N = 106; 1 week; at least 4 valid days with 1 weekend day
      – Average daily moderate-intensity minutes of physical activity (Freedson’s cut-off points)
      – Average daily step counts
Methods

• **Generalized linear models**
  - Gamma variance function
  - Identity or logarithmic link function
  - Robust standard errors (cluster effects)
  - Models adjusted for socio-demographic confounders
  - Models of objective measures of walking adjusted for total time of accelerometer wearing and number of weekend/holiday days
  - All continuous predictors centered around the mean
  - Separate models for each environmental attribute (small number of participants and clusters; preliminary findings)
## Results

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Low walkable areas</th>
<th>High walkable areas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Walking for transport (min/wk)</td>
<td>202 (187)</td>
<td>289 (258)*</td>
</tr>
<tr>
<td></td>
<td>140 (225)</td>
<td>182 (235)</td>
</tr>
<tr>
<td>Walking for recreation (min/wk)</td>
<td>112 (187)</td>
<td>116 (202)</td>
</tr>
<tr>
<td></td>
<td>59 (138)</td>
<td>20 (180)</td>
</tr>
<tr>
<td>Moderate-intensity physical activity</td>
<td>43 (26)</td>
<td>46 (24)</td>
</tr>
<tr>
<td>(Actigraph; min/day)</td>
<td>41 (26)</td>
<td>42 (25)</td>
</tr>
<tr>
<td>Step counts (daily)</td>
<td>9753 (3783)</td>
<td>10324 (3579)</td>
</tr>
<tr>
<td></td>
<td>9299 (3703)</td>
<td>10238 (4708)</td>
</tr>
</tbody>
</table>

87 min/wk difference

... between-area differences in walking variables ...

M (SD)
Median (IQR)
*p<0.01
Results … associations between perceived environment and measures of walking …

<table>
<thead>
<tr>
<th>Perceived neighborhood attribute</th>
<th>WT</th>
<th>WR</th>
<th>MPA</th>
<th>Steps</th>
</tr>
</thead>
<tbody>
<tr>
<td>Household density (5 – 1275)</td>
<td>1.001*</td>
<td>0.997*</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Street connectivity (1 – 4)</td>
<td>1.41***</td>
<td>0.93</td>
<td>1.12</td>
<td>1.03</td>
</tr>
<tr>
<td>Traffic safety (1 – 4)</td>
<td>1.50**</td>
<td>0.98</td>
<td>1.09</td>
<td>1.14*</td>
</tr>
<tr>
<td>Crime (1 – 4)</td>
<td>1.17*</td>
<td>0.56*</td>
<td>1.00</td>
<td>1.01</td>
</tr>
<tr>
<td>Green areas (1 – 4)</td>
<td>0.96</td>
<td>1.80**</td>
<td>1.05</td>
<td>1.01</td>
</tr>
<tr>
<td>Indoor places for walking (1 – 4)</td>
<td>1.17*</td>
<td>0.85</td>
<td>0.95</td>
<td>0.98</td>
</tr>
<tr>
<td>Building aesthetics (1 – 4)</td>
<td>1.21</td>
<td>1.76*</td>
<td>1.03</td>
<td>1.03</td>
</tr>
<tr>
<td>Social environment (1 – 4)</td>
<td>1.09*</td>
<td>1.13</td>
<td>1.17*</td>
<td>1.09*</td>
</tr>
<tr>
<td>Indirect access to services (1 – 4)</td>
<td>1.16</td>
<td>1.90**</td>
<td>1.09</td>
<td>1.08*</td>
</tr>
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*WT* = walking for transport; *WR* = walking for recreation; *MPA* = moderate-intensity physical activity;

*P* <.05; **P* <.01; ***P* <.001

Walking for different purposes is associated with different environmental attributes.

Some attributes may facilitate one type but hinder another types of walking – effects cancel out.
Results ... associations between perceived environment and measure of walking ...

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<tr>
<td>Land use mix – diversity (1 – 5)</td>
<td>Within</td>
<td>1.22*</td>
<td>1.13*</td>
<td>1.13</td>
<td>1.03</td>
</tr>
<tr>
<td></td>
<td>Outside</td>
<td>0.92*</td>
<td>1.00</td>
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<tr>
<td>Traffic hazards (1 – 4)</td>
<td>Within</td>
<td>1.25</td>
<td>0.95</td>
<td>1.32***</td>
<td>1.13**</td>
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<tr>
<td></td>
<td>Outside</td>
<td>1.12</td>
<td>1.28**</td>
<td></td>
<td></td>
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<tr>
<td>Fences separating traffic from pedestrians (1 – 4)</td>
<td>Within</td>
<td>1.00</td>
<td>0.97</td>
<td>1.08*</td>
<td>1.07*</td>
</tr>
<tr>
<td></td>
<td>Outside</td>
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Negative aspects of the environment are sometimes offset by walking outside the neighborhood
Results ... associations between perceived environment and measure of walking ...

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Associations between environmental characteristics and objectively-measured walking varied by measure

Moderate-intensity minutes of PA as measured by accelerometry may not capture the substantial amount of low-intensity walking in Hong Kong residents
Main points ... discussion

- High level of walking ... some at low intensity
- Outcome dependent on measure of walking
- Importance of examining location of walking
- Walking for transport:
  - Destinations matter ... however ...
    - Poor access within the neighbourhood offset by good public transport
- Walking for recreation
  - Aesthetics; crime; traffic and destinations matter ...
  - Negative aspect of the neighbourhood environment offset by accessibility to other neighbouring areas