Development and Validation of Measures to Study the Effects of the Built Environment on Walking in Hong Kong Older Adults

Cerin E, Macfarlane DJ and Sit C – Institute of Human Performance
Ho SY and Johnston JM – School of Public Health
Chow KL – Sau Po Centre on Aging
Chan MW, Cheung MC and Ho KS – Elderly Health Service, Department of Health
Background

- Number of 65+ year olds: 27% of population in 2033
- 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

Need for valid and reliable exposure and outcome measures for Chinese elders
- Extant measures developed in Western countries
- Most measures developed for an adult population (18-65 years)
Aim

- To develop/adapt and validate interviewer-administered self-report measures of:
  - Perceived neighborhood environmental characteristics related to walking
  - Within- and outside-neighborhood walking
Methods: Instruments

- A questionnaire of perceived environmental factors was developed from the Neighborhood Environment Walkability Scale – Abbreviated (NEWS-A; Cerin et al., 2006)

  Residential density
  Land use diversity (distance to destinations)
  Access to services
  Physical barriers to walking
  Indoor places for walking
  Fence separating footpath and traffic
  Bridge/overpass connecting to services
  Easy access of residential entrance
  Traffic speed

  Social disorder / littering
  Crime
  Street connectivity
  Infrastructure for walking
  Aesthetics
  Presence of people
  Crowdedness
  Traffic road hazards
  Sitting facilities
Methods: Instruments

- A questionnaire on walking behaviour was based on the **Neighbourhood Physical Activity Questionnaire (NPAQ – Giles-Corti et al., 2006)**
  - Walking for transport within the neighbourhood
  - Walking for recreation within the neighbourhood
  - Walking for transport outside the neighbourhood
  - Walking for recreation outside the neighbourhood
  - Frequently visited destinations
Methods: questionnaire adaptation

• Translation; back-translation
• Adaptation by multidisciplinary panel
  – Physical activity
  – Urban planning
  – Physiotherapy
  – Public health
• Pre-test on 50 Chinese-speaking elders (65+ years), members of the Elderly Health Centres
  • cognitive interviews and randomization to different response scales
Methods:

Participants and procedure:

• N = 484 (aged 65+) – multi-stage stratified sampling strategy
  – Four areas varying in socio-economic status and walkability
    • High SES and high walkability
    • High SES and low walkability
    • Low SES and high walkability
    • Low SES and low walkability
  – 8 residential blocks per area; 15 participants per residential block

• N=94 for reliability study – balanced by selected residential blocks; wore an accelerometer and kept diary of walks; completed questionnaires twice (14-20 day apart)

• Environmental audits of neighbourhoods (400m radial buffers) using a validated tool

Walkability (GIS) = dwelling density + street connectivity
Methods: Analyses

- Factorial validity of the NEWS-CS (perceived neighbourhood environment)
  - Confirmatory factor analysis
- Reliability of NEWS-CS and Walking questionnaire
  - Intraclass correlation coefficients, % agreement, Kappa statistics
- Validity: correspondence between perceived and objectively measured neighbourhood environmental characteristics
  - Regression analysis with robust standard errors
- Validity: correspondence between walking questionnaire and diary/accelerometer measures
  - Intraclass correlation coefficients
Results

- Factorial validity of the NEWS-CS (perceived neighbourhood environment)
  - 13 inter-correlated factors and 4 single items
  - Good fit (CFI: 0.90; SRMR: 0.058; RMSEA: 0.041)
  - Measurement model comparable to those of international studies

- Reliability of NEWS-CS
  - Acceptable (ICC>0.50 or % agreement>60 for items with low variability) for all items/subscales except for:
    - Distance to video/audio shop, Western non-fast food restaurant, Western coffee shop and public toilet
Results

- Validity: correspondence between perceived and objectively measured neighbourhood environmental characteristics (associations)

<table>
<thead>
<tr>
<th>Attribute</th>
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</thead>
<tbody>
<tr>
<td>Residential density</td>
<td>0.23b</td>
<td>Aesthetics</td>
<td>0.16b</td>
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<tr>
<td>Land-use mix - diversity</td>
<td>0.16b</td>
<td>Social disorder / litter</td>
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<td>Access to services</td>
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<td>Presence of people</td>
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<td>Physical barriers to walking</td>
<td>0.25b</td>
<td>Crime</td>
<td>0.14a</td>
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<td>Street connectivity</td>
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<td>Fence separating traffic from footpath</td>
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<td>Human and motorized traffic</td>
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<td>Bridge/overpass connecting to services</td>
<td>0.22b</td>
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<td>Infrastructure for walking</td>
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<td>Sitting facilities</td>
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<tr>
<td>Indoor places for walking</td>
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Results

• Reliability of Walking questionnaire
  – Moderate to excellent test-retest reliability for items gauging frequent destinations (Kappa: 0.42 to 0.78; % agreement: 69% to 100%)
  – Acceptable (ICC>0.50 or % agreement>60% for items with low variability) for all items but walking for transport outside the neighbourhood (ICC: 0.37)
Results

- Validity: correspondence between walking questionnaire and diary/accelerometer measures

<table>
<thead>
<tr>
<th>Type of walking</th>
<th>Minutes of walking mean (SD)</th>
<th>Minutes of walking mean SD</th>
<th>ICC</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Questionnaire</td>
<td>Diary/accelerometer</td>
<td></td>
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<tr>
<td>Transport – within neigh’</td>
<td>269 (254)</td>
<td>275 (166)</td>
<td>0.52</td>
</tr>
<tr>
<td>Transport – outside neigh’</td>
<td>60 (150)</td>
<td>95 (95)</td>
<td>0.35</td>
</tr>
<tr>
<td>Recreation – within neigh’</td>
<td>261 (250)</td>
<td>250 (179)</td>
<td>0.60</td>
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<tr>
<td>Recreation – outside neigh’</td>
<td>57 (143)</td>
<td>49 (105)</td>
<td>0.77</td>
</tr>
</tbody>
</table>
Conclusions

- The NEWS-CS and Walking questionnaire are sufficiently reliable and valid instruments of perceived neighbourhood walkability and walking behaviour, respectively, suitable for Hong Kong senior residents.

- The newly developed instruments can be used to identify aspects of the built environment that affect the walking behaviour and, consequently, health of Chinese-speaking older adults living in Hong Kong.

- Results from this research line will inform public health and land-use policies and practices for the creation of age friendly cities.
Thank You!

Questions?