Green Space Quantity and Mental Health: Evidence on Gender Differences in Relationships and use of Work Status as a Proxy for Exposure

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Introduction

Methods

Results
- Part 1: Green space quantity (GSQ) effect sizes (Mental Health)
  (i) gender differences
  (ii) work status as a proxy for exposure
  (iii) screening outliers and exceptional cases
- Part 2: Factors underlying gender differences in GSQ-MH relationships

Discussion

Conclusions
More green space is linked to less stress in deprived communities: Evidence from salivary cortisol patterns

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Green Space and Stress: Evidence from Cortisol Measures in Deprived Urban Communities

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Mitigating Stress and Supporting Health in Deprived Urban Communities: The Importance of Green Space and the Social Environment

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The research centre for inclusive access to outdoor environments
Research objectives

1. Examine **gender differences** in green space quantity (GSQ) - mental health relationships
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2. Explore use of **work status as a simple proxy for exposure** to the local neighbourhood environment
Research objectives

1. Examine **gender differences** in green space quantity (GSQ) - mental health relationships

2. Explore use of **work status** as a **simple proxy for exposure** to the local neighbourhood environment

3. Examine the impact of removal of **outliers** and **exceptional cases** on findings
Poverty in Scotland at worst levels in 30 years: 1/3 population living in multiple deprivation (UK Poverty and Social Exclusion Survey 2013)
1 in 3 people are estimated to be affected by mental illness in any one year (Scottish Government)

Adults living in the most deprived areas are approximately twice as likely to have common mental health problems as those in the least deprived areas (22% versus 11%) – (Health Scotland)
Methods
Research Design

Cross-sectional

CAPI survey

4 disadvantaged urban communities in Scotland (Edinburgh and Dundee)

Residents > 16 years

June 2010

N = 406
Measures

Health and Wellbeing
- **Perceived Stress Scale, PSS** (Cohen & Williamson, 1988)
- **Mental wellbeing, SWEMWBS** (Steward-Brown et al., 2009)
- Physical activity
- General Health
- Life Satisfaction

Green space: **objective + subjective**
- **quantity**
- quality
- accessibility
- usage
Measures: Green space quantity

- **GS Quantity (% unit area)**
- **Ward**
- **Zone**
- **Hutton Land Use Class**

- James Hutton Institute ‘Land Use Class’ (SGov PAN65)
- Public open space, gardens + roadside trees and grass
- 300m buffer around the home
Study sample

3 communities: n = 305
Study sample

GS Quantity (% unit area)

- Ward
- Zone
- Hutton Land Use Class

HLUC Green space quantity: n = 206
Analysis

Hierarchical Multiple Linear Regression (MLR)
- Block 1: Age, Income Coping, Deprivation (Carstairs Index), Employment, Education, Life partner, Children
- Block 2: Physical activity
- Block 3: Green space quantity

+ Moderation by Gender
Regression analyses

1. **Study sample** \((n = 206)\)

2. Individuals not in full time work: ‘**Subgroup A**’ \((n = 147)\)

3. Individuals most likely to spend a greater proportion of their time at home, based on work status: ‘**Subgroup B**’ \((n = 68)\)
   
   (i) looking after the home/family
   (ii) retired
   (iii) long term sick and disabled
Regression analyses

1. Study sample \((n = 206)\)

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Regression analyses

(1) Study sample
(2) Subgroup A: ‘Not in full time work’
(3) Subgroup B ‘At home most’

By Gender (+M&F combined)

Exceptional adverse life conditions ‘EALC’ filter
(sample screened of (i) outliers + (ii) all individuals reporting a sig. negative impact of recent life event)
Perceived stress (PSS)

Mental wellbeing (SWEMWBS)
Sample characteristics

<table>
<thead>
<tr>
<th></th>
<th>Study sample</th>
<th>Subgroup A: Not in full time work (n = 147)</th>
<th>Subgroup B: At home most (n = 68)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>All</td>
<td>Male</td>
<td>Female</td>
</tr>
<tr>
<td>n (%)</td>
<td>206 (100)</td>
<td>85 (41)</td>
<td>121 (59)</td>
</tr>
<tr>
<td>Age [n = 205]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>mean (SD)</td>
<td>44 (17)</td>
<td>46 (17)</td>
<td>43 (17)</td>
</tr>
<tr>
<td>min, max</td>
<td>16, 82</td>
<td>16, 82</td>
<td>16, 74</td>
</tr>
<tr>
<td>Work status (n,%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Working full-time</td>
<td>29</td>
<td>39</td>
<td>21</td>
</tr>
<tr>
<td>Working part-time</td>
<td>16</td>
<td>4</td>
<td>25</td>
</tr>
<tr>
<td>Job seeking</td>
<td>19</td>
<td>27</td>
<td>14</td>
</tr>
<tr>
<td>In education (full or part-time)</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Looking after home/family</td>
<td>9</td>
<td>0</td>
<td>15</td>
</tr>
<tr>
<td>Sick or disabled</td>
<td>4</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>Retired</td>
<td>19</td>
<td>20</td>
<td>18</td>
</tr>
<tr>
<td>Unknown</td>
<td>2</td>
<td>2</td>
<td>&lt;1</td>
</tr>
</tbody>
</table>

Ethnicity:
- White Scottish 96%
- Other UK 1.6%
- Non-UK 2.3%
Perceived stress (PSS): mean = 13.9 (SD = 6.3), males = 13.1, females = 14.4

Mental wellbeing (SWEMWBS): median = 28 (IQR = 5), males = 28, females = 27
Physical activity: median = 14 (IQR = 15), males = 12, females = 15

Green space quantity mean = 50% (SD = 14), males = 50%, females = 50%
Perceived stress scale (PSS) - green space quantity relationships

(i) All participants (no filter)

(ii) Screened (EALC filter)
Mental wellbeing (SWEMWBS) – GSQ relationships

(i) All participants (no filter)

- Males
- Females
- Males + Females

(ii) Screened (EALC filter)

- Males
- Females
- Males + Females
Gender differences in relationships

1. Distinct gender differences in relationships between GSQ and mental health outcomes
   - Consistently positive GSQ effect for MH for males
   - More complex for females (+ve and -ve effects)

2. Gender was not a significant moderator of PSS or SWEMWBS
Work status as a proxy for exposure

GSQ effect sizes increased in strength across analysis groups, strongest for Subgroup B (‘At home most’), particularly for:
- Males
- Perceived stress
Screening the sample: ‘EALC’ filter

Resulted in:
- greater number of sig. green space quantity (GSQ) effects
- larger GSQ effects for males
- consistent pattern of results between males and females
Other observations

1. Findings broadly consistent between PSS and SWEMWBS

2. Green space quantity accounted for considerably more variance in PSS (3–52%) compared to SWEMWBS (3-12%)

3. Physical activity was not a significant predictor of PSS, but was a significant predictor of SWEMWBS (up to 26% variance for males, 8% for females)
Discussion
Discussion

Comparison with other studies: any overall pattern?
<table>
<thead>
<tr>
<th>Green space metric</th>
<th>Heath outcome</th>
<th>Green space effect / relation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green space metric</td>
<td></td>
<td>Direction: Better health with more GS?</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Males</td>
</tr>
<tr>
<td>Quantity / relative amount (%)</td>
<td>300 m buffer</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>300 m buffer, Subgroup B</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>300 m buffer</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>SWEMWBS</td>
<td>x</td>
</tr>
<tr>
<td></td>
<td>SWEMWBS, EALC filter</td>
<td>x</td>
</tr>
<tr>
<td></td>
<td>UK CAS Ward, binary (43%)</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>UK CAS Ward, binary 'low' GS group only</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>Perceived stress (PSS)</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>Cortisol mean and slope</td>
<td>+</td>
</tr>
<tr>
<td>Quantity (&quot;)</td>
<td>1km buffer</td>
<td>x</td>
</tr>
<tr>
<td></td>
<td>3km buffer</td>
<td>-</td>
</tr>
<tr>
<td>Quantity (&quot;)</td>
<td>UK CAS Ward</td>
<td>x</td>
</tr>
<tr>
<td></td>
<td>GHQ-12 'Perceived risk of poor health'</td>
<td>+</td>
</tr>
<tr>
<td>Proximity (distance)</td>
<td>X (300 m ?) to park, freq users only ()</td>
<td>x</td>
</tr>
<tr>
<td>Access (physical and freq visits)</td>
<td>Perceived stress (LS-test)</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>Mental health and vitality (SF-6)</td>
<td>+</td>
</tr>
<tr>
<td>Quantity / relative an UK CAS Ward</td>
<td>GHQ-12 (Mental distress)</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>Depressive symptoms</td>
<td>x</td>
</tr>
<tr>
<td></td>
<td>Cardiovascular mortality</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>Respiratory disease mortality</td>
<td>+</td>
</tr>
</tbody>
</table>
Discussion

Comparison with other studies: any overall pattern? *Maybe...*

Methodology recommendations
- routinely stratify analyses by gender
- account for exposure
- screen sample...
- PSS and physical activity
- ++++
Limitations

Work status proxy: crude assumptions around time at home + notable differences in some variables imp. for mental health across analysis subgroups e.g. age, physical activity (but...)

Assumes uniform quality of green space (but limited variation expec.)

Assumes binary gender (but sample is small)

Cross-sectional study – selection effects (but disadvantaged communities only)
Conclusions
Conclusions

Relationships between amount of green space in the environment and mental health can differ significantly by gender, in both direction and/or magnitude.

Effect sizes for residential green space based on whole study populations may substantially underestimate for gender and other subgroups, such as those with a greater level of exposure (e.g. older people, children).
Conclusions

Work status may serve as a crude but useful proxy for exposure to neighbourhood green space.

Methodological handling of data (e.g. treatment of outliers and exceptional cases) can have a significant impact on results and their interpretation.

Further research is needed to confirm findings - use existing datasets.
James Hutton: http://www.hutton.ac.uk/research/projects/green-health
OPENspace: http://www.openspace.eca.ed.ac.uk/research-projects/greenhealth

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