ELSEVIER

Health & Place 14 (2008) 887–891

HEALTH & PLACE

www.elsevier.com/locate/healthplace

Short Report

Do features of public open spaces vary according to neighbourhood socio-economic status?

David Crawford[a,*], Anna Timperio[a], Billie Giles-Corti[b], Kylie Ball[a], Clare Hume[a], Rebecca Roberts[a], Nick Andrianopoulos[a], Jo Salmon[a]

[a]*Centre for Physical Activity and Nutrition Research, Deakin University, 221 Burwood Highway, Burwood 3125, Australia*
[b]*School of Population Health, University of Western Australia, Australia*

Received 19 July 2007; received in revised form 4 November 2007; accepted 5 November 2007

Abstract

This study examined the relations between neighbourhood socio-economic status and features of public open spaces (POS) hypothesised to influence children's physical activity. Data were from the first follow-up of the Children Living in Active Neighbourhoods (CLAN) Study, which involved 540 families of 5–6 and 10–12-year-old children in Melbourne, Australia. The Socio-Economic Index for Areas Index (SEIFA) of Relative Socio-economic Advantage/Disadvantage was used to assign a socioeconomic index score to each child's neighbourhood, based on postcode. Participant addresses were geocoded using a Geographic Information System. The Open Space 2002 spatial data set was used to identify all POS within an 800 m radius of each participant's home. The features of each of these POS (1497) were audited. Variability of POS features was examined across quintiles of neighbourhood SEIFA. Compared with POS in lower socioeconomic neighbourhoods, POS in the highest socioeconomic neighbourhoods had more amenities (e.g. picnic tables and drink fountains) and were more likely to have trees that provided shade, a water feature (e.g. pond, creek), walking and cycling paths, lighting, signage regarding dog access and signage restricting other activities. There were no differences across neighbourhoods in the number of playgrounds or the number of recreation facilities (e.g. number of sports catered for on courts and ovals, the presence of other facilities such as athletics tracks, skateboarding facility and swimming pool). This study suggests that POS in high socioeconomic neighbourhoods possess more features that are likely to promote physical activity amongst children.

Keywords: Children; Play; Parks; Playgrounds; Social disadvantage; Deprivation

Introduction

Given the known benefits of physical activity for health (US Department of Health and Human Services, 1996), low rates of physical activity participation amongst persons of low socio-economic status (SES) (Gidlow et al., 2006) are of concern. One potential explanation for these socio-economic inequalities is that there are fewer opportunities for physical activity in socio-economically disadvantaged neighbourhoods. Various features of neighbourhood environments, such as access to destinations, footpaths and walking trails, have been identified as correlates of physical activity (Owen et al., 2004;

*Corresponding author. Tel.: +61 9244 6616; fax: +61 9244 6091.
E-mail address: dcraw@deakin.edu.au (D. Crawford).

1353-8292/$ - see front matter © 2007 Elsevier Ltd. All rights reserved.
doi:10.1016/j.healthplace.2007.11.002

McCormack et al., 2004). Furthermore, area-level SES has been associated with physical activity (Sundquist et al., 1999; Kavanagh et al., 2005). A limited number of studies have also shown that the distribution of recreational facilities or spaces varies by area-level SES, although findings are equivocal (Macintryre et al., 1993; Estabrooks et al., 2003; Giles-Corti et al., 2003; Smoyer-Tomic et al., 2004; Cradock et al., 2005; Ellaway et al., 2007; Pearce et al., 2007).

Public open spaces (POS) (parks) have been identified as an important venue for physical activity (Bedimo-Rung et al., 2005; Krenichyn, 2005), particularly for children (Veitch et al., 2006). In a previous study, we found that the availability of POS (the density and total area of parks) did not vary by neighbourhood SES (Timperio et al., 2007). However, like much of the previous research, that study considered only availability of parks, and not the park features that may explain socio-economic variations in physical activity. Incorporating park features has been shown to be an important predictor of high levels of walking in adults (Giles-Corti et al., 2005). This paper examines associations between neighbourhood SES and the features of parks that might promote physical activity in children. To our knowledge no previous studies have investigated this issue.

Methods

Data in this study were drawn from the Children Living in Active Neighbourhoods (CLAN) Study, which is a longitudinal study examining individual, social and environmental influences on children's physical activity, sedentary behaviours and weight. The CLAN study commenced in 2004 and involved a follow-up of families of 5–6-year-old and 10–12-year-old children who had participated in a study of family influences on physical activity in 2001. Recruitment of the baseline sample has been described previously (Timperio et al., 2004). Briefly, 1210 families of 5–6-year-old and 10–12-year-old children were recruited from 19 state elementary schools in high and low socio-economic areas of metropolitan Melbourne, Australia. A subset of 540 families ($n = 167$ younger children and $n = 373$ older children) agreed to be recontacted in the future for further research and were subsequently invited to participate in the 2004 follow-up.

Identification of public open spaces

Participant addresses were geo-coded using a Geographic Information System (GIS). The Open Space 2002 spatial data set (provided by the Australian Research Centre for Urban Ecology) was used to identify all free or reserved access (limited public access) POS within an 800 m radius of each participant's home, excluding educational institutions and golf courses. A radius of 800 m was selected since parents have previously indicated this to be a reasonable walking distance for their child (Timperio et al., 2004). All spatial analyses were conducted using ESRI ArcView 3.3 and extensions. A total of 1497 POS were visited over a 3-month period by members of the project team and an audit of the features present was completed for each POS.

Measures

Neighbourhood socio-economic status

The Socio-Economic Index For Areas (SEIFA) Index of Relative Socio-Economic Advantage/Disadvantage (Australian Bureau of Statistics, 2003), compiled from the 2001 Census of Population and Housing, was used to assign an SES index score to each child's neighbourhood, based on their postcode. A high SEIFA score reflects a neighbourhood with a low proportion of people with low incomes and relatively few unskilled people in the workforce and a high proportion of people with high incomes and a skilled workforce. Neighbourhoods were stratified into quintiles of SES for analyses. The 1497 POS audited were approximately equally distributed across the five neighbourhood level SES quintiles. The lowest SES quintile had 314 POS, quintile two had 307, quintile three had 288, quintile four had 303, and quintile five (highest SES) had 285 POS.

Public open space audit

An audit tool (the Children's POS Tool, or C-POST) was developed to assess features of POS that were hypothesised, based on previous literature, to be potentially important in influencing children's physical activity (a copy of the audit instrument is available from the authors). Features assessed in the audit tool are listed in Table 1. The intra- and inter- rater reliability of the audit tool was tested on a random selection of 19 POS that 10 auditors assessed on two occasions, at least 1 week

Table 1
Features of public open spaces assessed in the Children's Public Open Space Tool

Recreational facilities (sum of)
Number of full courts
Number of ovals
Number of sports catered for
Number of athletics tracks
Other track and field facilities
Skate boarding facility
BMX tracks
'Part' courts (e.g. tennis walls)
Outdoor swimming pool
Indoor swimming pool
Availability of amenities (sum of)
Presence of rubbish bins
Presence of barbecue facilities
Presence of picnic tables
Presence of other seating
Presence of drinking fountains
Presence of public toilets
Presence of kiosk/café
Presence of shade or sheltered areas (man made)
Number of playgrounds
Club rooms for sporting clubs
Presence of walking paths
Presence of cycling paths
Presence of lighting along paths
Presence of trees that provide shade
Presence of a water feature (e.g. river, creek)
Presence of signage regarding dogs
Presence of signage restricting other activities

apart. Results showed all items to have at least adequate reliability (Table 2).

Data analysis

Data were analysed using Stata version 8 (Stata Corp, College Station, TX, 2003). Differences in the features of POS were examined across quintiles of SES. For continuous variables (e.g. the number of recreational facilities and the number of available amenities), analysis of variance with Scheffe post-hoc tests were used. For the categorical variables (e.g. the presence of walking and cycling paths), Pearson's χ^2 tests were used. A significance level of $p<0.01$ was adopted for these analyses.

Results

Compared with POS in lower socioeconomic neighbourhoods, POS in the highest socioeconomic neighbourhoods had more amenities (e.g. picnic tables, drink fountains and toilets) and were more likely to have trees that provided shade, a water feature (e.g. pond, lake and creek), walking and cycling paths, lighting, signage regarding dog access and signage restricting other activities (Table 1). There were no differences in the number of playgrounds or the number of recreation facilities.

Table 2
Features of public open space (POS) according to neighbourhood level socio-economic status

	Quintiles of socio-economic status					
	Quintile 1 (lowest SES) ($n=314$)	Quintile 2 ($n=307$)	Quintile 3 ($n=288$)	Quintile 4 ($n=303$)	Quintile 5 (highest SES) ($n=285$)	p-Value[†]
Number of recreational facilities (mean (SD))	0.6(1.6)	0.8(2.4)	0.9(2.1)	0.7(2.2)	1.0(3.2)	0.312
Number of playgrounds (mean (SD))	0.5(0.6)	0.5(0.6)	0.5(0.6)	0.5(0.6)	0.5(0.6)	0.537
Amenities score (mean, SD))[‡]	1.5(1.9)	1.6(2.2)	2.0(2.5)	1.5(2.1)	2.6(2.4)	<0.0001
Walking paths (%)	52.5	54.1	62.2	61.9	70.2	<0.0001
Cycling paths (%)	42.4	46.9	49.8	51.3	62.8	<0.0001
Lighting along paths (%)	12.8	5.2	11.2	12.0	21.6	<0.0001
Trees providing shade (%)	34.7	42.3	50.7	60.9	77.5	<0.0001
Water feature (%)	15.7	16.4	15.3	15.3	26.4	0.001
Signage regarding dogs (%)	23.6	16.6	18.8	10.6	50.9	<0.0001
Signage restricting other activities (%)	8.3	14.0	14.3	10.4	18.9	0.002

[†]Significant trend (analysis of variance) for continuous variables, Pearson's χ^2 for categorical variables.

[‡]Significant difference between quintiles 1 and 5, quintiles 2 and 5, quintiles 3 and 5, and quintiles 4 and 5 (Scheffe post hoc tests, $p\leqslant 0.05$).

Discussion

This study aimed to examine socio-economic differences in features of POS in metropolitan Melbourne, Australia. The study shows that in metropolitan Melbourne, POS in higher SES neighbourhoods were more likely than those in low SES neighbourhoods to possess a number of features that are likely to support children's physical activity. A strength of this study is that it relied on objective audit data regarding a large number of POS from socio-economically diverse neighbourhoods; although the study involved only a sample of parks, not all parks in Melbourne, it is possible that some additional parks may have been created after data in the Open Space spatial data were collected. Additionally, SEIFA may not be sensitive enough to capture the variation in SES within neighbourhoods. However, as far as we are aware this is the first study to examine differences in POS features by neighbourhood SES in children.

Our findings are generally consistent with previous research (Estabrooks et al., 2003; Macintryre et al., 1993; Giles-Corti et al., 2003) and support the hypothesis that persons of lower socio-economic position may be less active partly because there are fewer opportunities for recreational physical activity in socioeconomically disadvantaged neighbourhoods. However, in the present study the number of playgrounds and recreational facilities was not lower in POS in low SES areas. Our data do not allow us to determine whether the quality of these facilities varies with neighbourhood SES. It may be, for example, that playgrounds in the POS in low SES areas were older, less attractive or had broken equipment, and this may partly explain SES gradients in physical activity. This is worthy of future research.

It could be argued that low SES neighbourhoods are likely to be found in higher density inner city area and, therefore, have fewer picnic tables, fountains, ponds and bike paths, and other features largely due to available space rather than to SES. In Melbourne (and other Australian capital cities) low SES neighbourhoods are distributed throughout the greater metropolitan region—i.e. there may be some near the inner city area (along with some high SES neighbourhoods) but low SES neighbourhoods are also found on the outer metropolitan fringe. Our data therefore suggest that POS in low SES neighbourhoods have fewer features that support children's physical activity. These findings should be considered by those involved in urban planning and design, particularly those working in low SES areas.

Although this study shows features of parks hypothesized to be important in influencing children's physical activity variation by neighbourhood SES, it remains to be determined whether POS features predict physical activity, or explain SES differences in physical activity. Future research should examine relations between the quality of parks, as well as park features, and other key determinants of children's physical activity (e.g. parental support) and children's use of these spaces and their physical activity.

Acknowledgements

This project was supported by a grant from the NHMRC (ID 274309). David Crawford and Anna Timperio are supported by Public Health Research Fellowships from the Victorian Health Promotion Foundation. Kylie Ball and Billie Giles-Corti are supported by Career Development Awards from the National health and Medical Research Council/National Heart Foundation. Jo Salmon is supported by a Career Development Award from the National Heart Foundation.

References

Bedimo-Rung, A., Mowen, A., Cohen, D., 2005. The significance of parks to physical activity and public health. American Journal of Preventive Medicine 28, 159–168.

Cradock, A., Kawachi, I., Colditz, G., Hannon, C., Melly, S., Weicha, J., Gortmaker, S., 2005. Playground safety and access in Boston neighbourhoods. American Journal of Preventive Medicine 28, 357–363.

Ellaway, A., Kirk, A., Macintyre, S., Mutrie, N., 2007. Nowhere to play? The relationship between location of outdoor play areas and deprivation in Glasgow. Health and Place 13, 557–561.

Estabrooks, P.A., Lee, R., Gyuresik, N., 2003. Resources for physical activity participation: does availability and accessibility differ by neighbourhood socioeconomic status. Annals of Behavioural Medicine 25, 100–104.

Gidlow, C., Halley Johnston, L., Crone, D., Ellis, N., James, D., 2006. A systematic review of the relationship between socio-economic position and physical activity. Health Education Journal 65, 338–367.

Giles-Corti, B., Macintyre, S., Clarkson, J.P., Pikora, T., Donovan, R.J., 2003. Environmental and lifestyle factors associated with overweight and obesity in Perth, Australia. American Journal of Health Promotion 18, 93–102.

Giles-Corti, B., Broomhall, M., Knuiman, M., Collins, C., Douglas, K., et al., 2005. Increasing walking: how important is distance to, attractiveness, and size of public open space? American Journal of Preventive Medicine 28, 169–176.

Kavanagh, A.M., Goller, J.L., King, T., Jolley, D., Crawford, D., Turrell, G., 2005. Urban area disadvantage and physical activity: a multilevel study in Melbourne, Australia. Journal of Epidemiology and Community Health 59, 934–940.

Krenichyn, K., 2005. The only place to go and be in the city: women talk about exercise, being outdoors, and the meanings of a large urban park. Health and Place 12, 631–643.

Macintryre, S., MacIver, S., Sooman, A., 1993. Area, class and health: should be focusing on places or people? Journal of Social Policy 22, 213–234.

McCormack, G., Giles-Cort, iB., Lange, A., Smith, T., Martin, K., Pikora, T., 2004. An update of recent evidence of the relationship between objective and self-report measures of the physical environment and physical activity behaviours. Journal of Science and Medicine in Sport 7, 74–80.

Owen, N., Humpel, N., Leslie, E., Bauman, A., Sallis, J.F., 2004. Understanding environmental influences on walking; review and research agenda. American Journal of Preventive Medicine 27, 67–76.

Pearce, J., Witten, K., Hiscock, R., Blakely, T., 2007. Are disadvantaged neighbourhoods deprived of health-related community resources? International Journal of Epidemiology 36, 348–355.

Smoyer-Tomic, K.E., Hewko, J., Hodgson, M., 2004. Spatial accessibility and equity of playgrounds in Edmonton, Canada. The Canadian Geographer 48, 287–302.

Sundquist, J., Malmstrom, M., Johansson, S., 1999. Cardiovascular risk factors and the neighbourhood environment: a multilevel analysis. International Journal of Epidemiology 28, 841–845.

Timperio, A., Crawford, D., Telford, A., Salmon, J., 2004. Perceptions about the local neighborhood and walking and cycling among children. Preventive Medicine 38, 39–47.

Timperio, A., Ball, K., Salmon, J., Roberts, R., Crawford, D., 2007. Is availability of public open space equitable across areas? Health and Place 13, 335–340.

US Department of Health and Human Services, 1996. Physical activity and health: a report of the Surgeon General. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease and prevention, International Medical Publishing, Altanta.

Veitch, J., Bagley, S., Ball, K., Salmon, J., 2006. Where do children usually play? A qualitative study of parents' perceptions of influences on children's active free-play. Health and Place 12, 383–393.