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Are perceptions of the local environment related to neighbourhood satisfaction and mental health in adults?

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Abstract

Background. Perceptions of environmental attributes can influence satisfaction with where people live and mental health status. We examined the association between perceived environmental characteristics, neighbourhood satisfaction, and self-rated mental health.

Methods. We report cross-sectional data from the Physical Activity in Localities and Community Environments (PLACE) study in Australia (n=2194). Self-report data included socio-demographics, perceived attributes of the environment, neighbourhood satisfaction (NS) and mental health status. Neighbourhood SES was obtained through census data. Factor analysis was used to identify dimensions of NS. Generalized linear models were used to examine associations between NS and perceived environment characteristics and whether aspects of NS were independently associated with mental health.

Results. NS factors identified were safety and walkability, access to destinations, social network, travel network, and traffic and noise. Perceived environmental characteristics of aesthetics and greenery, land use mix – diversity, street connectivity, traffic safety, infrastructure for walking, access to services and barriers to walking were found to be positively associated with these factors. Traffic load and crime were negatively associated. Three NS factors (safety and walkability, social network, and traffic and noise) were independent predictors of mental health.

Conclusions. Neighbourhood satisfaction may mediate the association between perceived environmental characteristics and measures of mental health in adults.

Keywords: Perceived physical environment; Mental health; SF-12; Neighbourhood satisfaction

Neighbourhood environments are being increasingly recognised as playing a role in influencing health (Kawachi and Berkman, 2003). Place effects on health have been extensively explored and conceptualised with a considerable body of research investigating material conditions of neighbourhoods and on area-level effects of socioeconomic status (SES) (Macintyre et al., 2003; Macintyre, Maciver and Solomon, 1993). It is less known how perceptions of neighbourhood physical and social characteristics relate to health outcomes. Specific aspects of the environments in which people live may exert a unique influence on physical and mental health above and beyond SES influences.

Studies have investigated associations between perceived neighbourhood environment characteristics and mental health (e.g., Sooman and Macintyre, 1995; Wen et al., 2006; Wilson et al., 2004). There is evidence of a relationship between neighbourhood characteristics (e.g., crime, access to amenities, neighbourliness and green space) and neighbourhood satisfaction and self-reported physical and mental health (De Vries et al., 2003; Maas et al., 2006; Takano et al., 2002). It appears that the perception of neighbourhood characteristics may influence the level of satisfaction with living in a community. This in turn may impact on some aspects of mental health (i.e., stress, depression, anxiety). For example, prolonged exposure to daily hassles and stresses can have a detrimental effect on mental well-being (Lu, 1991). Living in a place a person dislikes can be a constant and long-term source of stress leading to more permanent

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psychosocial distress (Miller and Townsend, 2005). In one Hong Kong study, psychological well-being of older residents depended on the level of residential satisfaction (Phillips et al., 2005). Lighting, green areas/parks, recreation areas and road crossing/traffic density were found to be related to psychological well-being.

Perceived characteristics found to be related to neighbourhood satisfaction and self-reported health are green space, access to amenities, crime, traffic load and safety, and various aspects of social capital. *Green space* and exposure to nature is thought to have a beneficial effect on health with recent epidemiological studies showing a positive effect of green areas on self-reported health (De Vries et al., 2003; Maas et al., 2006) and longevity (Takano et al., 2002). *Access to amenities* has been linked with better mental health and social integration in adults while *crime and traffic* have been shown to be predictive of poorer mental health (Bowling et al., 2006; Macintyre et al, 2003). Living in a neighbourhood considered dangerous can be emotionally distressing. Visible evidence of physical disorder in the form of graffiti, litter and vandalism may trigger negative emotions and fear of crime (Sampson and Raudenbush, 1999) and in the long term neighbourhood signs of crime could potentially lead to chronic anxiety and depression (Mirowsky and Ross, 2003). Residents exposed to heavy traffic load are at risk of air pollution and potential traffic hazards and general health and depression are associated with perceived traffic stress (Gee and Takeuchi, 2004).

Various elements of *social capital*, at both the individual and community level, have been linked to health outcomes (Hawe and Shiel, 2000). These include the interactions which occur with family friends or neighbours resulting in active social networks and high levels of 'neighbourliness' (Bowling et al., 2006; Kawachi, 2002; Macintyre, Ellaway, Cummins, 2002). Those who are more involved tend to have better health than those who are less involved (Greiner et al., 2004; Kawachi, Kennedy and Glass, 1999). One Australian study found perceived neighbourhood safety to be related to physical health, and neighbourhood safety and connections (strength of connections with other neighbourhood residents) to be related to mental health (Ziersch et al., 2005).

In this study, we hypothesised that positive perceptions of environmental characteristics (such as aesthetics and greenery, access to services and destinations, lack of crime and traffic and traffic safety) would be associated with neighbourhood satisfaction and that neighbourhood satisfaction would mediate the relationship between perceived neighbourhood environmental characteristics and self-reported mental health.

Methods

Sample

This study is part of an observational epidemiological study known as PLACE (Physical Activity in Localities and Community Environments), conducted during 2003–2004 in Adelaide, Australia. Detailed methods of recruitment and response rates have been described elsewhere (du Toit et al., 2005). The sample was drawn from residential addresses within 32 neighbourhoods, assembled from clusters of contiguous Census Collection Districts (CCDs) identified using Geographic Information Systems methods as either high or low walkable (16 neighbourhoods each), and then selected as high or low SES, based on census level data. In each neighbourhood, 250 addresses were randomly selected and residents aged between 20 and 65 invited to participate. Eligible participants were sent two surveys including questions about the perceived environment, health status and socio-demographic characteristics. A total of 2194 eligible participants from 154 CCDs returned the questionnaires. The overall response rate was 11.5%. Over 74% of those known to be contacted completed the first survey and 84% of the participants who responded to the first survey completed the second survey. The University of Queensland Behavioural and Social Sciences Ethics Committee approved the study.

Measurement

Perceived environment characteristics

Perceived environmental characteristics were measured using the Australian version of the Neighbourhood Environment Walkability Scale (NEWS-AU; Cerin et al., 2008). The NEWS-AU assesses the following perceived neighbourhood characteristics: residential density; land use mix – diversity; land use mix – access; street connectivity; infrastructure for walking and cycling; aesthetics and greenery; traffic load; traffic safety; safety from crime; hilliness; physical barriers to walking; presence of cul-de-sacs; and parking difficulty. Except for the residential density and land use mix – diversity subscales, items are rated on a 4-point Likert scale with anchors ranging from 'strongly disagree' to 'strongly agree'. Scores on these scales are computed by averaging the ratings on the corresponding items. Ratings on the residential density items are weighted relative to the average residential density that a specific item represents (Saelens et al., 2003). Land use mix – diversity is assessed by the walking proximity from home to various types of stores and facilities, with responses ranging from 1 to 5-minute walking distance to >30-minute walking distance. This instrument has been shown to possess adequate reliability (Leslie et al., 2005) and validity (Cerin et al., 2008; 2006).

Neighbourhood satisfaction

Neighbourhood satisfaction was measured using a scale with good test–retest reliability (ICC=0.80) [James Sallis, personal communication December, 2006]. We used a modified scale asking "*How satisfied are you with...*" 17 physical and social environment items. Responses used a 5-point Likert-like scale ranging from strongly dissatisfied (1) to strongly satisfied (5). There is some conceptual overlap between perceived neighbourhood walkability (NEWS-AU) and the neighbourhood satisfaction scales in terms of environmental features (e.g., both consider access to services). However, these two scales measure distinctive concepts. While the NEWS-AU measures the presence or absence of environmental features, the neighbourhood satisfaction scale measures level of satisfaction with the presence or absence of environmental features.

Mental health status

Mental health status was measured using the SF-12 (Ware et al., 1995), scored with weights from the Australian National Health Survey. The SF-12 is a self-report measure which allows for the calculation of a composite mental health summary score (range 0–100) with higher scores indicating better health.

Statistical analyses

Identification of neighbourhood satisfaction factors

Principal Components Analysis with oblique rotation was conducted to identify summary measures (dimensions) of neighbourhood satisfaction. For each identified dimension of neighbourhood satisfaction summary measures were created by averaging the ratings on the corresponding items.

Associations between perceived neighbourhood characteristics and neighbourhood satisfaction

Generalised linear models (GLM) with robust estimates of standard errors (to account for clustering effects) were used to examine associations between environmental characteristics and dimensions of neighbourhood satisfaction (Hardin and Hilbe, 2001). These associations were adjusted for age, gender, educational attainment, annual household income, and CCD-level median household size and income. Univariate and multivariate models exploring associations between environmental characteristics and neighbourhood satisfaction were estimated.

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Table 1
Multivariate associations between perceived environmental characteristics and neighbourhood satisfaction factors in the PLACE[a] study, after controlling for SES

Perceived environmental characteristic	Safety and walkability		Access to destinations		Social network		Travel network		Traffic and noise	
	b	95% CI	*b*	95% CI	*b*	95% CI	*b*	95% CI	*b*	95% CI
Residential density	NE		0.003***	0.002, 0.004	NE		NE		−0.001	−0.002, 0.001
LUM – diversity	0.07*	0.01, 0.12	0.16***	0.09, 0.23	0.10*	0.02, 0.18	0.10***	0.05, 0.16	NE	
Access to services	0.02	−0.03, 0.06	0.33***	0.26, 0.40	0.06	−0.02, 0.14	0.03	−0.03, 0.09	NE	
Street connectivity	NE		0.03	−0.02, 0.08	0.10**	0.04, 0.17	0.07**	0.02, 0.12	−0.13	−0.20, −0.06
Infrastructure for walking	0.08**	0.02, 0.13	0.08*	0.01, 0.16	0.02	−0.06, 0.11	0.11***	0.04, 0.18	0.02	−0.07, 0.11
Aesthetics and greenery	0.49***	0.42, 0.56	0.28***	0.19, 0.36	0.22***	0.11, 0.33	0.11***	0.04, 0.17	0.20	0.09, 0.32
Traffic load	−0.15***	−0.19, −0.10	−0.04	−0.10, 0.02	−0.14***	−0.21, −0.07	NE		−0.48	−0.55, −0.41
Traffic safety	0.04*	0.01, 0.08	0.06*	0.01, 0.12	0.03	−0.03, 0.10	0.07**	0.02, 0.11	0.33	0.26, 0.40
Crime	−0.38***	−0.51, −0.25	−0.02	−0.13, 0.08	NE		NE		NE	
Hilly streets	NE		NE		NE		NE		NE	
Barriers to walking	−0.03	−0.08, 0.01	−0.06*	−0.11, −0.01	NE		−0.05*	−0.10, −0.01	0.004	−0.057, 0.067
Parking difficult	0.01	−0.02, 0.04	−0.02	−0.05, 0.02	NE		−0.05***	−0.08, 0.02	−0.03	−0.08, 0.02
Not many cul-de-sacs	NE		NE		NE		0.03*	0.00, 0.06	−0.02	−0.06, 0.02
Footpaths separated	NE		NE		NE		0.01	−0.2, 0.05	−0.02	−0.06, 0.03

Note: Only significant characteristics from 'univariate' models were included in the multivariate models presented here; *$p<.05$; **$p<.01$; ***$p<.001$. *b* = regression coefficient; CI = confidence interval; LUM = land use mix; NE = not entered in the model; SES = socioeconomic status. All reposted regression coefficients were adjusted for age, gender, educational attainment, annual household income, neighbourhood (Census Collection Districts) median household size and neighbourhood median weekly household income.

[a] PLACE = Physical Activity in Localities and Community Environments study, conducted in Adelaide, Australia 2003–4.

Neighbourhood satisfaction as a mediator of the relationships between perceived environmental characteristics and mental health

To examine whether neighbourhood satisfaction is a mediator of the relationships between perceived characteristics of the neighbourhood environment and mental health, we used the joint significance test (MacKinnon et al., 2002). We would conclude that there is evidence for a mediational effect if a specific characteristic is significantly associated with a dimension of neighbourhood satisfaction and if the same dimension of neighbourhood satisfaction is significantly associated with mental health after adjusting for the effects of perceived neighbourhood characteristics. Hence, a second set of GLMs examined the effects of neighbourhood satisfaction on self-reported mental health after controlling for socio-demographics and relevant perceived environmental characteristics.

Finally, given that mental health might in general determine feelings of satisfaction rather than the opposite, a model where all aspects of neighbourhood satisfaction were simultaneously entered as predictors of mental health was estimated.

Results

Dimensions of neighbourhood satisfaction

Five inter-correlated neighbourhood satisfaction factors were identified (Appendix A). These were 'Safety and walkability' (6 items), 'Access to destinations' (4 items), 'Social network' (2 items), 'Travel network' (3 items), and 'Traffic and noise' (2 items). These factors explained 66% of the total item variance.

Associations between perceived neighbourhood characteristics and neighbourhood satisfaction

Table 1 shows that several perceived environmental characteristics were independently associated with neighbourhood satisfaction factors. For instance, land use mix – diversity, aesthetics and greenery and traffic safety were positively associated with the *safety and walkability* factor, while traffic load and crime were negatively associated.

Some neighbourhood characteristics had stronger associations with neighbourhood satisfaction than others. For example, while having footpaths separated from the traffic by cars was not related to any of the dimensions of neighbourhood satisfaction, perceived neighbourhood aesthetics and greenery was positively associated with all aspects of neighbourhood satisfaction.

Table 2
Independent associations between neighbourhood satisfaction factors and mental health in the PLACE[a] study, after controlling for SES and perceived environmental attributes

Dimension of neighbourhood satisfaction (range 1–5)	Mental health			
	Separate models for each NS dimension	95% CI	All NS dimensions entered	95% CI
Safety and walkability	2.89**	2.17, 3.61	1.53**	0.77, 2.29
Access to destinations	1.17**	0.60, 1.75	−0.003	−0.632, 0.625
Social network	2.09**	1.68, 2.49	1.74**	1.31, 2.17
Travel network	1.13*	0.37, 1.89	0.49	−0.28, 1.27
Traffic and noise	1.27**	0.82, 1.72	0.80**	0.36, 1.24

*$p<.01$; **$p<.001$; CI = confidence interval; NS = neighbourhood satisfaction; SES = socioeconomic status.

Note: Here only estimates of interest are presented. These are regression coefficients of specific neighbourhood satisfaction factors.

[a] PLACE = Physical Activity in Localities and Community Environments study, conducted in Adelaide, Australia 2003–4.

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Neighbourhood satisfaction as a mediator of the relationships between perceived environmental characteristics and mental health

Table 2 (separate models for each NS factor) shows that all dimensions of neighbourhood satisfaction were associated with self-reported mental health. These results support the hypothesis that the dimensions of neighbourhood satisfaction were potential mediators of the relationships between perceived aspects of the neighbourhood environment and self-reported mental health. When all dimensions of neighbourhood satisfaction were entered in the regression model (Table 2; all NS factors entered), three of the neighbourhood satisfaction factors (safety and walkability, social network, traffic and noise) remained significant predictors of self-reported mental health. These aspects of neighbourhood satisfaction were positively associated with perceived land use mix – diversity, infrastructure for walking, aesthetics and greenery, traffic safety, and street connectivity, and negatively associated with traffic load and crime (Table 1).

Discussion

Our study showed that three of the neighbourhood satisfaction factors (safety and walkability, social network and traffic and noise) were significant correlates of residents' mental health. These findings suggest that aesthetics and greenery, crime, and traffic load and safety may be particularly important perceived environmental factors impacting on residents' mental health. Previously, people reporting dissatisfaction with certain physical features (such as traffic) were more likely to report poor emotional health, while those reporting satisfaction with features (such as aesthetics and social factors) were less likely to report poor emotional health (Wilson et al., 2004). Satisfaction with overall neighbourhood characteristics, including safety and relationships to neighbours has also been associated with self-rated emotional health status (Cho et al., 2005). Our findings suggest a mediating role of neighbourhood satisfaction in the relationship between perceived neighbourhood characteristics and self-reported mental health.

There are a number of possible explanations for the relationships found. In the case of aesthetics and greenery, having a more pleasant and appealing environment could benefit feelings of health. This may occur through the mechanisms of stress relief and restoration of emotional states (Frumkin, 2006). Simply visiting natural places or viewing nature is associated with better mental health (Frumkin, 2001; Korpela and Ylen, 2007; Urlich, 1993), with one study reporting that views of nature through residents windows contributed substantially to both their own sense of well-being and to neighbourhood satisfaction (Kaplan, 2001).

The negative influence of perceived crime and traffic load and safety on neighbourhood satisfaction could be related to these features directly eliciting stress or exposing residents to unpleasant elements in the environment. Our 'safety from crime' item included signs of social disorder (graffiti and garbage). These visible elements in the environment are likely to influence fear of crime, which has been linked to feelings of safety and how people feel about their neighbourhood (Sampson and Raudenbush, 1999). It is plausible that negative perceptions of one's neighbourhood for a sustained amount of time can contribute to overall stress and therefore affect mental health. Perceptions of traffic and the effects of vehicular burden may also contribute to stress in a similar way as does fear of crime.

Social network was found to predict mental health. This is not surprising, given previous reviews of social capital and mental health (Almedon, 2005; De Silva et al, 2005). The finding that the perceived environmental characteristics influencing this relationship (Table 1) were land use mix – diversity, street connectivity, aesthetics and traffic load is of interest in explaining the mechanisms for this association. An explanation for this may be that the perception of greenery encourages residents to enjoy the outdoors where they are likely to meet their neighbours. Better access to services and higher levels of street connectivity may also encourage walking in the neighbourhood which facilitates social interaction. The finding that traffic load was a negative influence could reflect the presence of busy roads and higher traffic flow making neighbourhood streets busy and difficult to cross and inhibiting residents from having social interaction. However, as the social network factor derived from only two items it may not measure more salient aspects of social contact such as quality (Schwiran and Schwiran, 1993).

Study limitations and strengths

Limitations include the use of self-reported health and the lack of definition as to the size of 'neighbourhood' in asking about satisfaction. Given the cross-sectional nature of this study, identification of neighbourhood satisfaction as a mediator of the relationship between neighbourhood characteristics and mental health is only indicative as causality cannot be established. A number of other factors that contribute to mental health were not included in this study, such as social support from neighbours and friends.

The use of neighbourhood satisfaction factors derived from physical and social domains in the environment is a strength of our study, as is the use of perceived environment measures with good measurement properties and a high level of correspondence to objective measures of the environment (Cerin et al., 2007; Leslie et al., 2005). An additional strength is that all analyses were controlled for SES which accounts for SES-dependent contextual characteristics of residents living in objectively different neighbourhoods.

Conclusions

Perceptions of environmental characteristics related to the local neighbourhood may be important contributors to mental health. When residents perceive their environment to be more aesthetic, safer and more socially integrated, mental health can be enhanced. Consideration of residents' perceptions can be used by professionals involved in aspects of policy and planning and the design of healthy communities. Providing residential development patterns that support higher neighbourhood satisfaction is desirable. Future research should examine how changes in

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neighbourhood satisfaction over time may influence health outcomes and behaviours.

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Appendix A

Neighbourhood satisfaction items and factors (factor weight in brackets)

Safety and walkability (6 items)
- How easy and pleasant it is to walk in your neighbourhood (0.78)
- How easy and pleasant it is to bicycle in your neighbourhood (0.71)
- The safety from threat of crime in your neighbourhood (0.52)
- Your neighbourhood as a good place to raise children (0.51)
- Your neighbourhood as a good place to live (0.78)
- The quality of schools in your neighbourhood (0.71)

Access to destinations (4 items)
- The access to shopping in your neighbourhood (0.45)
- Access to entertainment in your neighbourhood (restaurants, movies, clubs, etc) (0.81)
- The number and quality of food shops in your neighbourhood (0.85)
- The number and quality of restaurants in your neighbourhood (0.90)

Social network (2 items)
- How many friends you have in your neighbourhood (0.91)
- The number of people you know in your neighbourhood (0.94)

Travel network (3 items)
- The highway access from your home (0.64)
- The access to public transport in your neighbourhood (0.77)
- Your travelling time to work/school (0.60)

Traffic and noise (2 items)
- The amount and speed of traffic in your neighbourhood (0.90)
- The noise from traffic in your neighbourhood (0.88)

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