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ORIGINAL ARTICLE

The Mediating Effect of Perceived Risk on the Relationship between Physical Incivilities and Health in Residential Areas

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ABSTRACT

Previous studies have linked incivilities to public health, but varied in outcomes and methods used. The present study examined perceived risk as a potential mediator of the relationship between perceptions of physical incivilities and self-rated health in a multi-ethnic residential neighbourhood. A sample of 241 residents in Penang, Malaysia was analysed by using structural equation modelling. Results demonstrated that respondents with high levels of perceived incivilities likewise exhibited high tendencies to report frequent feelings of risk in their neighbourhood environment. Results also indicated that physical incivilities and perceived risk had negative impacts on health outcomes. Findings further suggest the mediating effect of perceived risk on the relationship between physical incivilities and health, implying the direct and indirect negative effects of physical disorder on health. This study concludes by highlighting incivility-reduction strategies that can be applied in disorderly areas.

Keywords: physical disorder, perceived risk, health, mediating effect, structural equation modelling.

Introduction

Concerns about the impact of the built environment on health and wellbeing tend to focus on the physical deterioration of the surrounding area (Xuan, 2019). Neighbourhoods serve as the heart of communities and thus play a key role in people's wellbeing. Neighbourhood incivility is normally used in studies of people's perceptions of the built environment. A growing body of evidence reiterates the possible negative impacts of incivilities and risk perceptions on the health and wellbeing of residents (Robinette et al., 2019). Living in a disadvantaged area may increase risk perceptions (Medway et al., 2016) and impair residents' health (Ross & Mirowsky, 1999). Skogan (1990) suggested that fear of crime facilitators are based on people's perception of the spatial environment, which is one known cue of social and physical disorder. Franklin and Franklin (2009) stated that in a neighbourhood, the absence of concern and lack of informal social control could result in fear of disorder and may threaten individuals more than actual victimisation. LaGrange et al. (1992) also reported that neighbourhood incivilities are more powerful than crime itself in representing feelings.

Incivility has two main categories, namely, social and physical (Skogan, 1990). However, this study focuses on physical incivility due to its huge impact on health and wellbeing. Physical incivilities refer to disorderly environments such as trash and litter, vacant houses, abandoned cars, vandalised property and dilapidated homes, whereas social incivilities refer to disruptive elements such as loose dogs, public intoxication, unsupervised youth, inconsiderate neighbours, beggars, loiterers, gangs and excessive noise (Austin et al., 2002; Franklin & Franklin, 2009). Physical incivilities can affect residents' perceptions in two ways. First, physical incivilities can influence residents to permit infractions against social order and to less likely intervene to prevent crime and incivilities. Second, residents experience concerns when

observing disorderly features. Consequently, they prefer to spend their leisure times at home and are unlikely to interact with neighbours (Jones et al., 2011). As such, residents do not spend time in public spaces, indicating poor social control and health outcomes.

Previous studies have measured the quality of the physical environment by focusing on residents' perceptions of their dwellings and neighbourhoods (Austin et al., 2002). A study on neighbourhood health and quality of life is especially important in the context of Penang, which is listed amongst states with high housing prices. According to the Department of Statistics Malaysia (2014), the residential mobility pattern is quite high in Penang as compared with other states. A recent survey on residential location preferences in Penang Island based on residents' desires and aspirations concluded that other states are more likely to be chosen over Penang (Fattah et al., 2018). The present study captured residents' perceptions of incivilities in a low to medium class neighbourhood in Penang, Malaysia, to study the effects of physical incivility on residents' risk perceptions and quality of life. Determining the means to enhance health and wellbeing may be especially important in Malaysia with its various ethnic backgrounds, because previous research suggests low levels of health and wellbeing in similar multi-ethnic communities (Williams & Collins, 2016).

Theoretical background of the study

Shaw and McKay (1942) initiated the disorder model while testing their social disorganisation theory throughout Chicago City. This theory focuses on the relationship between crime, social control and neighbourhood structure (Kubrin & Weitzer, 2003), with an emphasis on the latter and its physical conditions. Several studies found a direct and positive relationship between physical incivilities and both perceived risk and fear of crime (Cohen et al., 2000). Perceived risk includes cognitive judgments such as on danger after dark and the possibility of victimisation (Franklin & Franklin, 2009; Gabriel & Greve, 2003). A growing body of evidence supports the notion that perceived risk towards the surrounding environment is linked to poor health outcomes (Baum et al., 2009; O'Brien et al., 2019).

According to Greenberg (1999), the ideal neighbourhood is safe, clean and stable, whereas poor neighbourhood quality is associated with crime and physical incivilities. Dunstan et al. (2005) reported that characteristics of incivility such as litter, vandalism, graffiti, abandoned cars, vacant properties and unmaintained gardens may decrease the quality of an area. Considering such factors is therefore important when measuring the perceptions of residents. Numerous academic works suggest that these factors may influence the morale and perceptions of residents (O'Brien et al., 2019). Overall, the current study explores the hypothesis that health and quality of life are in part a function of the physical characteristics of neighbourhood environments. Meanwhile, perceived risk is identified as a potential mediator between neighbourhood physical conditions and health (Lorenc et al., 2012; Marzbali et al., 2016, 2019). Table 1 depicts the operational definitions of the study variables.

The above-presented discussions lead to the following research hypotheses:

H1 Physical incivility is positively associated with perceived risk.

H2 Physical incivility is negatively associated with self-rated health.

H3 Perceived risk is negatively associated with self-rated health.

H4 Perceived risk mediates the relationship between physical incivility and self-rated health.

Methodology

Site Selection

This study constituted a portion of a larger research, which examined the physical characteristics of neighbourhoods and residents' wellbeing. The study was conducted in Penang, Malaysia, specifically in the Kampung Kastam area, which covered a sample of 241 residents in a neighbourhood with multiple ethnic backgrounds. The level of heterogeneity is not an issue because the study did not focus on social interactions among neighbours in terms of social bonds. As a typical low to medium class neighbourhood located in the central part of Penang Island, Kampung Kastam is a working-class

Table 1: Operationalization of the latent variables

Dimensions	Definitions
Physical incivilities	Residents' perceptions of physical incivility such as trash and litter, and vacant houses in the neighbourhood environment
Perceived risk	To what extent respondents felt safe in their neighbourhood.
Health	The extent to which respondents rate their general health and quality of life.

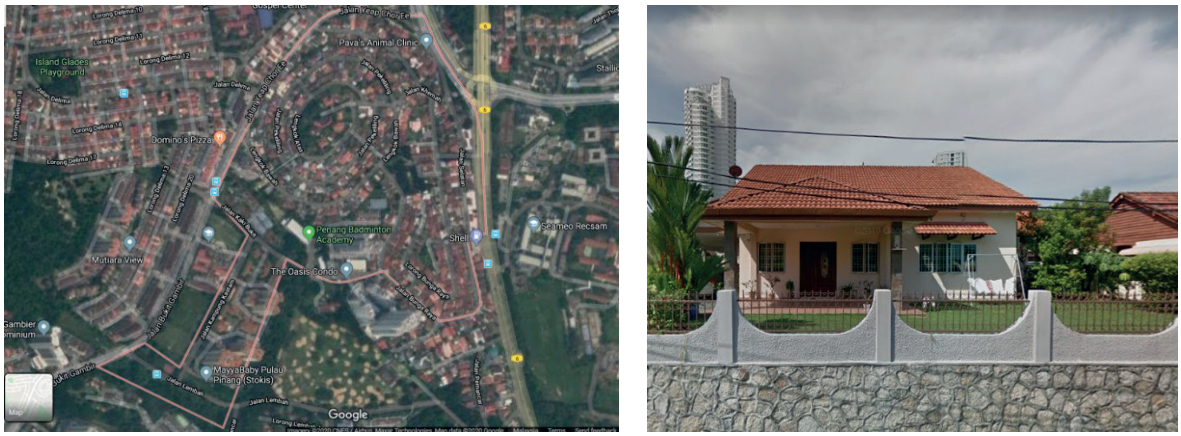

Figure 1: The site map of Kampung Kastam (left) and a typical single-storey house (Google Maps, 2019; Google Street View, 2019)

neighbourhood established to accommodate employees in the early 1960s. Numerous government quarters in this area are now vacant. Landed houses within Kampung Kastam are typically two-storey, but several are single-storey. Figure 1 shows the site map (left) and a typical single-storey house (right) in the study area.

A questionnaire survey was conducted to determine the residents' perceptions towards the physical neighbourhood environment. A systematic sampling method was used to select participants from the population. The survey was conducted in English and Malay on the basis of the respondents' preference and required approximately 10 minutes to complete. The study focused on residents of landed properties, which were the dominant type of dwelling in the study area. Table 2 depicts the demographic characteristics of the respondents. Among the 241 respondents, 50.2% were male and 49.8% were female, with a mean age of 48 years (SD = 17.42). Slightly over 63% of respondents have lived in their property for at least 10 years, implying a very stable neighbourhood with long-term occupants (M = 19.7, SD = 15.7).

Table 2: Respondents' demographic characteristics

Demographic variables	Categories	Island Glades (n = 247)
Ownership	Owner	180 (74.7%)
	Tenant	22 (9.1%)
	Others	39 (16.2%)
Gender	Male	121 (50.2%)
	Female	120 (49.8.2%)
Marital status	Single, widowed or separated	78 (32.4%)
	Married or living as married	163 (67.6%)
Ethnicity	Malay	62 (25.7%)
	Chinese	102 (42.3%)
	Indian	62 (25.7%)
	Others	15 (6.2%)
Education	University/college	121 (50.2%)
	Secondary education	99 (41.1%)
	Primary education	18 (7.5%)
	Non formal education	3 (1.2%)
Occupation	Self-employed	44 (18.3%)
	Private sector employee	51 (21.2%)
	Public sector employee	22 (9.1%)
	Retiree	64 (26.6%)
	Unemployed	31 (12.9%)
	Others	29 (12%)

Survey Instrument

The quantitative study prompted residents to respond to a set of self-administered questionnaires. Apart from providing their demographic information, participants responded to 15 statements that reflect physical incivilities, perceived risk, health and quality of life. Table 3 presents the study variables with their respective indicators.

Statistical Analyses

The proposed model and hypothesis testing were conducted by using Partial Least Squares (PLS) analysis with the SmartPLS 3 software (Ringle et al., 2015). PLS was chosen because of its suitability to the mediation model and the exploratory nature of this study. Nonparametric bootstrapping (Wetzels et al., 2009) was applied to test the significance of the path coefficient among and between the latent variables and the respective manifest variables. The measurement model (validity and reliability) and structural model (testing the relationship among variables) were

Table 3: Study variables with respective indicators

Construct	Item	Description
Perceived risk- Items were adapted from Franklin and Franklin (2009) and Mason et al. (2013). (1 = very safe, 5 = very unsafe)		
	PR1	How safe do you feel walking alone in your street during the day?
	PR2	How safe do you feel walking alone in your street after dark?
	PR3	How safe do you feel walking alone in this neighbourhood during the day?
	PR4	How safe do you feel walking alone in this neighbourhood after dark?
	PR5	How safe do you feel when you are in home alone at night?
	PR6	How safe do you feel when you are in a park or playground in your neighbourhood during the day?
Perceived disorder- Items were adapted from Foster et al. (2010), Gibson et al. (2002) and Sampson and Raudenbush (1999). (1 = not an issue/no problem, 7 = big problem)		
	PD1	Houses and fences not looked after.
	PD2	Littering and dumping of rubbish in public areas.
	PD3	Vandalism or graffiti in public properties.
	PD4	Inconsiderate or disruptive neighbors.
	PD5	Problems regarding selling and dealing with drugs.
	PD6	Teenagers hanging around the street.
Self-rated health- Items were adapted from Baum et al. (2009) and Wallace et al. (2012). (1 = poor, 5 =excellent)		
	SRHealth1	Would you say that your mental health is poor, fair, good, very good or excellent?
	SRHealth2	Would you say that your physical health is poor, fair, good, very good or excellent?
	SRHealth3	How would you describe your overall quality of life?

tested to finalise the outcome. In addition to the assessment of the path coefficient, three criteria were required to examine the structural model: coefficient of determination (R^2), effect size (f^2) and variance inflation factor (VIF).

Results and Findings

Measurement Model Results

The measurement model evaluation requires outer loadings, convergent validity, composite reliability and discriminant validity (Tables 4 and 5). For a given construct, the threshold value of composite reliability is 0.7 (Bagozzi & Yi, 1988). Table 4 posits that all constructs have composite reliability values above 0.70. Convergent validity is the average variance extracted, for which the threshold value is 0.5 (Fornell & Larcker, 1981). Consequently, all constructs possess convergent validity (Table 4).

The SmartPLS 3 software offers a unique measure to establish the discriminant validity for a pair of constructs: heterotrait–monotrait (HTMT) ratio and confidence interval, which have liberal threshold values less than 0.85 and 1, respectively (Henseler et al., 2015). Table 5 shows that the HTMT ratios and the corresponding confidence intervals for each pair are less than 0.85 and 1, respectively. Hence, the model possesses discriminant validity.

Additionally, the possibility of common method variance was examined by using Harman's one-factor test (Podsakoff et al., 2003). Common method variance occurs when only one factor emerges from a factor analysis

Table 4*:* The measurement model results for the latent constructs

Construct	Items	Loadings	Composite reliability (CR)	*t* value	Average variance extracted (AVE)
Physical disorder	PD1	0.820	0.907	24.390***	0.620
	PD2	0.812		20.771***	
	PD3	0.845		35.923***	
	PD4	0.776		24.974***	
	PD5	0.797		24.452***	
	PD6	0.663		12.355***	
Perceived risk	PR1	0.845	0.919	36.264***	0.654
	PR2	0.843		34.792***	
	PR3	0.855		44.621***	
	PR4	0.844		33.992***	
	PR5	0.771		23.199***	
	PR6	0.680		12.211***	
Self-rated health	SRH1	0.749	0.789	7.434***	0.555
	SRH 2	0.777		7.918***	
	SRH 3	0.707		6.620***	

Note. *** $p < .01$

or when the first factor explains more than 50% of the variance. In this light, all the items for the constructs were introduced into a factor analysis and the unrotated matrix indicated that the first factor explains 36% of the variance. Therefore, common method variance was not an issue in this study.

Assessment of the Structural Model

Table 6 depicts the results of the path analysis used to test the hypothesis of direct effects among latent variables. The results revealed the significant impact of physical incivilities on perceived risk (β = 0.379, p < 0.01) and health (β = –0.251, p < 0.01). In line with previous studies, the results suggest that high perceptions of incivilities in the neighbourhood environment were associated with high levels of perceived risk. This finding implies that respondents with high levels of perceived incivilities had higher tendencies to report frequent feelings of risk in the neighbourhood environment. Moreover, high perceptions of neighbourhood incivilities were associated with poorer general health. In line with previous studies, the results also indicated a negative and significant association between perceived risk and health (β = –0.212, p < 0.01), where high levels of perceived risk were associated with poorer general health and quality of life. Hence, the results support H1, H2 and H3.

This study also estimated a mediating relationship among the variables, as shown in Figure 2. The t value was computed with a sample of 1,000 by using a bootstrapping procedure suggested by Hayes (2009). The t value for the indirect effect is obtained by dividing the ab by the standard error (SE) of the indirect effect. SE is the standard deviation of the repeated bootstrap estimates of the indirect effect. The result shows that the t value of the indirect effect is significant at the 0.05 level (t = –2.530 > 1.96), thereby supporting H4.

The variance accounted for was calculated to estimate the size of the indirect effect through division by the total effect (Shrout & Bolger, 2002). The result shows that perceived risk explained approximately 24% of the variance in mediating the relationship between incivilities and health; the magnitude is also considered partial (Hair et al., 2013). On the basis of the R^2 values, the result reveals that incivilities explain approximately 14% of the variance in perceived risk, whereas incivilities and perceived risk explain approximately 15% of the variance in health.

Table 5: Heterotrait-Monotrait (HTMT)

	Physical disorder	Perceived risk
Perceived risk	0.362 **CI.90** (0.293, 0.533)	
Health	0.421 **CI.90** (0.259, 0.578)	0.362 **CI.90** (0.235, 0.512)

Table 6: Path coefficient and hypothesis testing (direct effects)

Hs	Relationship	β	t value	Decision	f^2	VIF
H1	Incivilities → Perceived risk	0.379	7.087***	Supported	0.168 (Moderate)	1.000
H2	Incivilities → Health	–0.251	3.507***	Supported	0.064 (Small)	1.168
H3	Perceived risk → Health	–0.212	2.783***	Supported	0.045 (Small)	1.168

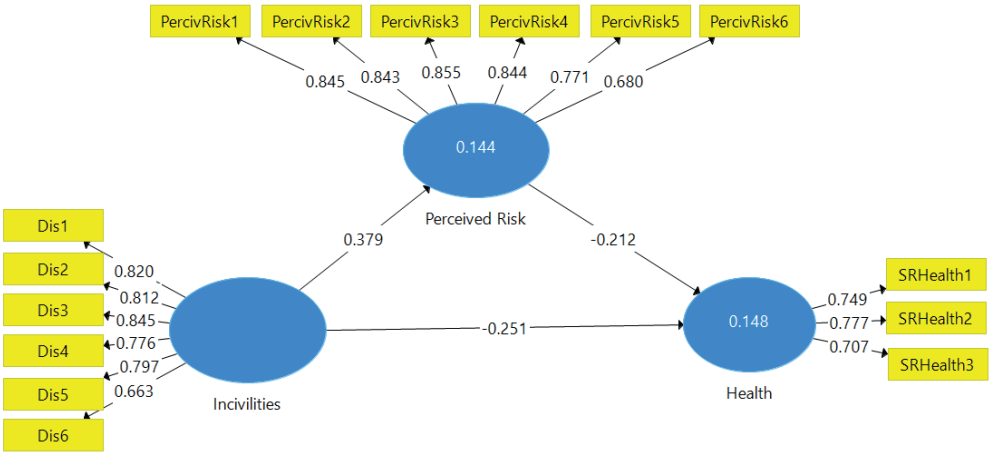

Figure 2: The parameter estimates of the PLS analysis

The purpose of calculating the effect size (f^2) is to estimate the extent of the influence of an independent latent variable on the dependent variable. Effect size is based on the change in the coefficient of determination (R^2). According to Chin (1998), the values of 0.02, 0.15 and 0.35 represent the effect size as small, moderate and substantial, respectively. Results reported that the f^2 for incivilities and perceived risk on health were 0.064 and 0.045, respectively. Multicollinearity among variables was also evaluated by using the criteria of variance inflation factor; all values were below the suggested threshold of 5.00 (Table 6) and thus were no cause for concern (Hair et al., 2013).

Conclusion

The significant impact of the built environment on health and wellbeing is widely acknowledged (World Health Organization, 2010). Evidence from previous research suggests that compared with the general population, residents in deprived neighbourhoods have an increased perception of risk (Algren et al., 2018). The current study seeks to investigate the relationship among physical incivilities, perceived risk, and health and wellbeing in a residential neighbourhood in Penang, Malaysia. The hypothesis is that if the built environment can affect residents' health and wellbeing, then the effect is likely caused by fostering or decreasing the degree of perceived risk. Consistent with those of a broad range of studies, the present results indicate that respondents who perceive high levels of physical incivilities in the surrounding environment likewise have high tendencies to report high perceptions of risk and poor health (Lorenc et al., 2012).

Although our findings are generally consistent across various contexts, several aspects are noteworthy for improvement. First, the cross-sectional study design precludes any inference of causal relationships between the physical characteristics of neighbourhoods and health outcomes. Second, this study only focuses on the effects of physical incivilities on health outcomes, but social incivilities might likewise affect health outcomes (Ambrey, 2016). Therefore, future research may bring new insights by focusing on both social and physical incivilities of the spatial environment. In addition, a study on physical incivilities using structured observation of a wide range of ethnic groups in Los Angeles neighbourhoods found that a high level of ethnic diversity is associated with a low level of physical disorder. Therefore, future research could examine ethnicity as a moderator in the relationship between incivilities and health outcomes.

Neighbourhood physical conditions therefore play a key role in shaping residents' behaviour and perceptions of the environment. Local authorities and neighbourhood communities have the potential to send a positive signal to residents that the neighbourhood is a pleasant living environment by maintaining and optimising its attributes. Crime prevention through environmental design strategies can be implemented to remedy perceptions of incivilities. Appropriate lighting, pavement treatments, maximum informal surveillance opportunities through building design, tidiness of lawns, landscaping maintenance and management and provision of legibility are several factors that could remedy physical incivilities and risk perceptions. Design of physical barriers such as landscaping, fences and walls should also provide good visibility. Basic features of such design strategies characterise a safe and pleasant living area.

This study recommends that local planning authorities pay attention to neighbourhood facilities such as adding mixed-use activities (increasing the variety of business uses and leisure activities by residents), eliminating concealed spots, designing streetscapes to enhance visibility and providing clear routes for different modes of traffic.

Competing Interests

No potential conflict of interest was reported by the author(s).

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