

## ASSESSING THE IMPACT OF LANDSCAPE DESIGN ON PERCEPTION OF SAFETY, PLACE ATTACHMENT AND PLACE SATISFACTION

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**Abstract:**

This study aims to evaluate the effects of landscape design on place attachment by considering the mediating roles of place satisfaction and perception of safety. The data were collected from 283 residents in Penang, Malaysia. By confirming the reliability and validity of the scales using composite reliability and confirmatory factor analysis, the results of structural equation modelling indicated that place satisfaction and perception of safety affect place attachment positively and significantly. In addition, landscape design affects the perception of safety, place satisfaction and place attachment positively and significantly. The results also indicated that perception of safety and place satisfaction mediated the relationship between landscape design and place attachment. This finding implies that landscape design contributes to an increased perception of safety and place satisfaction and consequently improved place attachment amongst residents. Therefore, this study suggests that designers and those involved in designing urban neighborhoods need to pay more attention to the design aspects of the built environment because it plays a significant role in the sense of attachment of individuals living in that area.

**Keywords:** Landscape design, place attachment, perception of safety, place satisfaction, Malaysia, CFA

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## INTRODUCTION

Currently, rapid urbanisation growth caused a wide range of negative impacts in various aspects on cities. Whilst the local authorities and other stakeholders were focusing on the policies and practices to improve the control and monitoring of urban growth, serious issues to inspire public trust and create a liveable place must be addressed (Blanco, 2018). Specifically, cities in developing countries face challenges due to lack of basic services, poverty and social class, environmental degradation, crippling traffic congestion, declining safety and security and residents' dissatisfaction (Abdullah *et al.*, 2015). These issues have been intensified in Asian countries as a host for half of the world's urban population due to weak control and supervision of urban boundary growth (Samat *et al.*, 2019). However, the growth of megacities is another issue in Asia urbanisation, when Asia alone will have at least 28 megacities by 2025 (Park, 2015). The rapid growth of megacities exacerbates urbanisation issues. Malaysia has experienced one of the most rapid urbanisations in South-East Asia over the last three decades, especially in two regions in Kuala Lumpur and Penang (Marzbali *et al.*, 2016).

The review of a large body of literature revealed that shifting administration powers from state to region and then to a neighbourhood according to hierarchy structures is a good practice in urban management approaches (Pirbabaei and Sajadzade, 2011). As a result, transmission can become the role of urban neighbourhood as a place for living to one of the city's cores. Furthermore, it intensifies social interaction; consequently, social interaction improves natural surveillance and social ties amongst the neighbourhoods' residents (Hedayati *et al.*, 2019). The findings of previous studies indicated that social ties and natural surveillance are two main factors for increasing residents' satisfactions and their place attachment (Farhad *et al.*, 2021; Isa *et al.*, 2021; Lee *et al.*, 2019; Maghsoodi-Tilaki *et al.*, 2021).

The analysis of the migration drivers has illustrated an internal migration in old cities where the residents have moved to new developed residential areas from old neighbourhoods of the central parts of cities (Islam *et al.*, 2018). Residents' sense of place and place attachment might decline because of the low quality of the place and the lack of residents' satisfaction (Chen *et al.*, 2021). Moreover, place attachment is a main factor for improving residents' contributions in the process of refining the neighbourhood quality (Isa *et al.*, 2021). However, place attachment and residents' participation provide a suitable opportunity to establish the participatory democracy system in the local

communities and enhance transparency in local community processes (Scannell and Gifford, 2010).

The urbanisation growth and urban physical expansion have changed the interaction between residents and their places (Milligan, 2003). The significant role of landscape design on residents' perceptions has been determined by previous studies in the social, economic and physiological fields of knowledge (Brown *et al.*, 2015). Considering the roles and advantages of landscape design on place quality and residents' perceptions, evaluating the role of landscape design in multi-ethnic neighbourhoods brings new insights into existing knowledge because only few studies focused on this matter.

Evidence suggested that place attachment is influenced by place satisfaction (Ramkissoon and Mavondo, 2015), perception of safety (Du, 2015; Fan and Qiu, 2014) and landscape design (Cheng and Wu 2015), and only a few studies examined the interactive relationships of these variables in a causal model. As environmental problems escalate in cities, developing landscape design has been emphasised by many residents. Evidence suggested that residents' satisfaction would increase when the landscape meets the residents' aesthetic requirements (Hassan *et al.*, 2022).

Generally, the impact of landscape design on residents' perceptions depends on the characteristics of places including aesthetics, attractiveness, cleanliness, visual permeability, no sense of disturbance, diversity, safety and vitality (Frey, 2003). Seemingly, spatial planning requires appropriate landscape designs of open spaces in urban neighbourhoods to increase the sense of place, perception of safety and place attachment within residents of the neighborhoods (Zenker and Rütter, 2014). This article aims to evaluate the impact of landscape design on place attachment by considering the mediating role of perception of safety and place satisfaction in a middle-class neighbourhood in Penang, Malaysia. Undoubtedly, Penang Island is recognised as the second largest city in Malaysia and has the second highest density of residents per square kilometre. The state of Penang population jumped from 1,524 to 1,684 persons per square kilometre from 2010–2016 (Department of Statistics Malaysia, 2016). Rapid and dense urbanisation has given rise to different social, environmental and physical concerns over the last decade. Since Penang has begun to become a smart city, the harmonisation of the urban built environment with the natural environment is vital to increasing local people's satisfaction and place attachment.

## PLACE ATTACHMENT

The term 'place' is a phenomenon that a human

identifies during life, attaches to it over time and integrates his life with it (Adams, 2015). Place is a location for humans involved over time, develops an emotional relationship and finally creates a phenomenon known as place attachment (Malone *et al.*, 2014). Place attachment refers to an emotional connection of an individual with a place (Scannell and Gifford, 2010). As a result, the place must meet human needs and expectations.

All three forms of interactions of individuals and groups, namely, cognitive, emotional and functional, adjusts with the place over time (Charkhchian, 2009). Place attachment is modified on the basis of the quality of space and layout of buildings and road network during certain times. The impact of place attachment on the perception of a place causes humans to rank the place in terms of place attachment (Sadeghi *et al.*, 2012). Scholars have described attachment to the neighbourhood as a deep emotional connection between people and places over time. Accordingly, attachment to the neighbourhood emerges to the levels of people's interactions in the neighbourhood. People's interactions contribute to neighbourhood affairs, and place attachment increases natural surveillance and perception of safety.

A positive perceived image can improve attachment to the place. Thus, organising public events and social gatherings creates memories or positive images amongst residents at the neighbourhood level (Isa *et al.*, 2021). However, place attachment and other feelings towards a place are formed on the basis of the social and physical characters of the place. Seemingly, the social characters of the neighbourhood are the most effective amongst the physical aspects of that neighbourhood. A comprehensive mental image of spatial phenomena leads to the rational perception of those phenomena and identification of a collective sense of place, safety, peace, confidence, versatility and compatibility with the place.

## PERCEPTION OF SAFETY

Basically, safety is one of the initial pre-requirements for all activities in human life and is known as one of the basic needs of inhabitants in cities. It significantly contributes to sustainable urban development process where a safer place increases the sense of peace, vitality and liveability amongst the residents of the neighbourhood (Maghsoodi-Tilaki *et al.*, 2021). In the past five decades, safety matters in cities have been emphasised by architects, urban designers and urban planners when a new criminological sub-discipline was introduced by Oscar Newman's Defensible Space theory.

Uncontrolled urban development, land-use change, and an increased building density have emerging harmful effects on the physical and mental health of residents and the natural environment of the city. Therefore, safety is one of the important concerns that emphasise health issues, reducing physical activities, social inclusion and well-being in developing countries (Marzbali *et al.*, 2016). A sustainable community requires the perception of safety rather than infrastructure, amenities and comfort, if not more because the societies are developed on micro or macro-scales in the light of peace and perception of safety (Maghsoodi-Tilaki *et al.*, 2021).

Considering that the perception of safety is amongst the most fundamental requirements for prosperity in any society, safety policies must prepare a set of arrangements that bring a high level of solidity and comfort and eliminate fear from any forms of crime in the society (Bayat, 2008). Perception of safety may inspire residents to share their ideas, thoughts and beliefs and motivates residents to grow social networks with their neighbours. In general, although a community may be safe, the residents have a lower perception of safety compared with the crime rate (Marzbali *et al.*, 2014). Although different studies have examined the effective factors on perception of safety, few studies investigated the relationship between the perception of safety and landscape design of open spaces in residential communities of developing countries.

## PLACE SATISFACTION

Place satisfaction refers to a degree of satisfaction that people perceive or experience in a specific place concerning the coverage of their needs, expectations and objectives (Amérigo and Aragones, 1997). Studies classified the influencing factors of place satisfaction into three categories, namely, residents' behaviours, attitudes and features of the residential environment (Chen *et al.*, 2019; Fernández-Portero *et al.*, 2017; Ren *et al.*, 2015).

However, place satisfaction is an aspect of residential neighbourhood that is related to quality of life (QoL). A wide range of characteristics influences QoL in a residential neighbourhood, namely, friendships, family status, community and housing quality (Chen *et al.*, 2019; Fornara *et al.*, 2010; Marans, 2003) and various aspects of place quality (Burinskiene and Rudzkiene, 2007; Chen *et al.*, 2019; Lazauskaitė *et al.*, 2015). As such, residential satisfaction contributes to residents' decision in staying or leaving a place (Chen and Dwyer, 2017). Ramkissoon and Mavondo (2015) investigated the relationship between residents' satisfaction and place attachment and found the direct



Fig. 1 Conceptual model of the study.

and indirect impacts between residential satisfaction and place attachment. This finding is consistent with Zenker and Rütter (2014), who indicated that residential satisfaction affected the level of place attachment. Moreover, satisfaction level and attachment to a place regulate residents' behaviour, attitudes and interaction with others (Isa *et al.*, 2021).

## LANDSCAPE DESIGN

Undoubtedly, urban landscape has a significant impact on urban social aspect (Grimm *et al.*, 2000; Pickett *et al.*, 2001). Place quality is increasingly being recognised as a main factor to improve residents' health and well-being in cities (Nilsson *et al.*, 2007). In recent years, interest in examining the relationship between urban landscape and social issues has increased (Picavet *et al.*, 2016; O'Sullivan *et al.*, 2016; Wartmann *et al.*, 2021).

Markevych *et al.* (2017) demonstrated the impact of urban green space on residents' health in three main parts: (i) lessening air pollution, noise and urban heat island; (ii) reducing residents' stress and impact on recovery and encouraging residents to engage in physical activity; and (iii) strengthening the social cohesion and more attention to vulnerable groups. Consequently, suitable urban green space motivates residents towards engaging in outdoor physical activities (Hartig *et al.*, 2014; Kardan *et al.*, 2015; Vujcic *et al.*, 2018). Physical activity improves residents' mental health, happiness and social interactions (Marzbali *et al.*, 2016).

Studies identified the effective factors of urban landscape on residents' activities and their health levels, namely, vegetation height, artificiality, presence of water, human preference, land surface status and powerfulness (Hofmann *et al.*, 2012; Real *et al.*, 2000). Consistently, evidence suggested that higher perceived naturalness and more physical activities resulted in improved well-being and sense of place and may reduce fear of crime in residential neighbourhoods

(Marzbali *et al.*, 2016; Sange *et al.*, 2016; Vujcic *et al.*, 2018).

## CONCEPTUAL MODEL OF THE STUDY

Fig. 1 shows the conceptual model of the study. The underlying theories to develop the conceptual model refers to environmental psychology, theory of place and attachment theory (Morgan, 2010). This study seeks to examine the indirect effects of landscape design on place attachment through multiple mediators. On the basis of the previous literature, considering the evidence for an overall positive association between landscape design and place attachment, we propose the following research hypotheses:

- H1. Landscape design is positively associated with place satisfaction.
- H2. Landscape design is positively associated with perception of safety.
- H3. Perception of safety is positively associated with place satisfaction.
- H4. Perception of safety is positively associated with place attachment.
- H5. Place satisfaction is positively associated with place attachment.
- H6. Perception of safety mediates the relationship between landscape design and place attachment.
- H7. Place satisfaction mediates the relationship between landscape design and place attachment.
- H8. The relationship between landscape design and place attachment is serially mediated by the perception of safety and place satisfaction.

## MATERIALS AND METHODS

### The Study context

The study was conducted in the southern region of Penang, Malaysia. This area was selected as the study

area because of its high burglary rate, high-density residential building and various types of open space in comparison with other neighbourhoods in Penang Island. Penang is growing to become one of the modern metropolises of Asia, having the second highest density of residents in Malaysia. Furthermore, Penang is the second growth centre in Malaysia and has been consistently categorised amongst the top investment destinations in the South-Asia over the last three decades. Generally, the study area is a middle-class neighbourhood that includes different types of housing that range from high-rise apartments to condominiums and terraced houses. It is one of the most rapidly developing districts in Penang.

This study employs probability sampling using a simple random method to select samples from the residents of the study area. A team of interview staff, which consists of USM undergraduate students, was organised and instructed to conduct the field survey in 2019, which was before the COVID-19 pandemic. They walked between houses and performed face-to-face interviews. The research determined the criteria to be used in the selection of eligible respondents for the study survey, and three criteria were applied: (1) residence in landed properties, (2) length of residence of at least one year and (3) age of at least 18 years.

In total, 500 questionnaires were distributed to the residents at the study location, of which 297 questionnaires were returned, but 14 questionnaires were discarded due to the incomplete information provided. In the end, 283 (59.5%) questionnaires were analysed.

## Materials

The questionnaires were distributed to the residents who have stayed in their houses for more than one year. The Likert scale measurement was employed to measure the study variables on a five-point scale. Each item is assigned from 1 (extremely disagree) to 5 (extremely agree). This measurement enables the respondents to rate every variable based on their opinions and perspectives. In addition to measuring the respondents' demographic characteristics, the questionnaire contains four other sections.

**Landscape design:** The landscape design was measured using eight items (e.g. vegetation, unity, spaciousness, well maintained, dynamic-area, undisturbed, tranquillity and quietness, and lighting (Buijs, 2009; Frey, 2003; Verbrugge and Born, 2018)) that focus on various aspects of the urban landscape. The respondents were asked to rate from a scale of 1 (extremely disagree) to 5 (extremely agree) the extent to which their agreement on the quality of landscape design criteria that can be observed in their residential areas. The scores for these

items were aggregated in a composite measure for landscape design (Cronbach's  $\alpha = 0.83$ ).

**Place attachment:** The items to measure place attachment were adapted based on the precedent studies (Guzmán *et al.*, 2019; Zhang and Zhang, 2017; Verbrugge and Born, 2018). Place attachment is measured by three components, namely, place identity (3 items), place dependence (3 items) and neighbourhood interactions (4 items). The respondents were asked to rate their agreement on the level of place attachment in their residential areas from a scale of 1 (extremely disagree) to 5 (extremely agree). The scores for these items were aggregated in a composite measure for place attachment (Cronbach's  $\alpha = 0.87$ ).

**Place satisfaction:** The items were adapted on the basis of studies from Baik (2018), Casakin *et al.* (2011), Maghsoodi Tilaki *et al.* (2021), and Türkoğlu *et al.* (2019) to measure place satisfaction. In the present study, place satisfaction is a second-order factor measured by four first-order factors, namely, green space (4 items), accessibility/transportation (5 items), maintenance and social relations (4 items), which can act as an indicator of this construct. The scores for these items were aggregated in a composite measure for place satisfaction (Cronbach's  $\alpha = 0.94$ ).

**Perception of safety:** The items were adapted on the basis of studies of Abdullah *et al.* (2015), Maghsoodi Tilaki *et al.* (2021), and Türkoğlu *et al.* (2019) to measure perception of safety. The perception of safety is measured by seven items, including fear of crime (4 items), permeability (2 items) and lighting (1 item). The participations described their feelings regarding crimes using a scale of 1 (very unlikely) to 5 (very likely). However, the scores for these items were aggregated in a composite measure for the perception of safety (Cronbach's  $\alpha = 0.89$ ).

## RESULTS

The CFA was used to validate the study variables by LISREL software, which determines the correlation between variables and factors, as well as factors and factors (Kline, 2016). The test examines whether the observed variables have significant factor loading on their underlying constructs. The fitness indexes, such as  $\chi^2/df$ , root mean square error of approximation (RMSEA), the (Adjusted) Goodness of Fit (GFI/AGFI), comparative fit index (CFI) and Normed Fit Index (NFI), were used to determine model fitness. These indexes have acceptable values, which indicate the good fitness of the model. According to Kline (2016),  $\chi^2/df < 3$  is acceptable; the smaller the ratio is, the better the fitness will be. The value of RMSEA less than 0.08 indicates a reasonable error for approximation in the population; however, the smaller the RMSEA, the lower

the error will be (Steiger, 1990). GFI/AGFI stand for the (Adjusted) Goodness of Fit, which correspond to the proportion of variance accounted for by the estimated population covariance. Generally, NFI, GFI, AGFI and CFI need to be  $\geq 0.90$  to ensure good fitness of the model (Kline, 2016).

**Measurement Model Results**

**Table 1** shows the CFA results for latent constructs. Obviously, all factor loadings  $> 0.5$  and all t-values show significant factor loadings. The results in CFA shows that all goodness of fit criteria have been met by the model. **Table 2** also indicates the goodness of fit indices for the CFA tests. These indexes suggest that the data are well fitted to the model.

**Second-order CFA for Place Satisfaction**

The analysis of models with second-order factors is one of the features of LISREL software. Second-order factor model can be defined as a factor model in which latent

factors measured by the observed variables are influenced variables are influenced by an underlying variable, such as latent variable, but at a higher level. In the present study, place satisfaction is evaluated by four components (namely, green space, accessibility, maintenance and management and social relations), which can act as an indicator of this construct. Therefore, a second-order CFA was performed to identify the final model of place satisfaction and to validate its components.

As shown in **Fig. 2**, the results suggest that all factor loadings of the indicators related to each first-order factor, as well as the factor loadings of first-order factors to place satisfaction, are good in predicting this variable.

**Fig. 3** presents the model and the regression values. Standardised values are listed on each path. All estimated coefficients of the direct paths are positive and significant. Except for the path from the perception of safety to place attachment, which is significant at  $P = 0.05$ , the remaining values are positive and significant at  $P = 0.01$ .

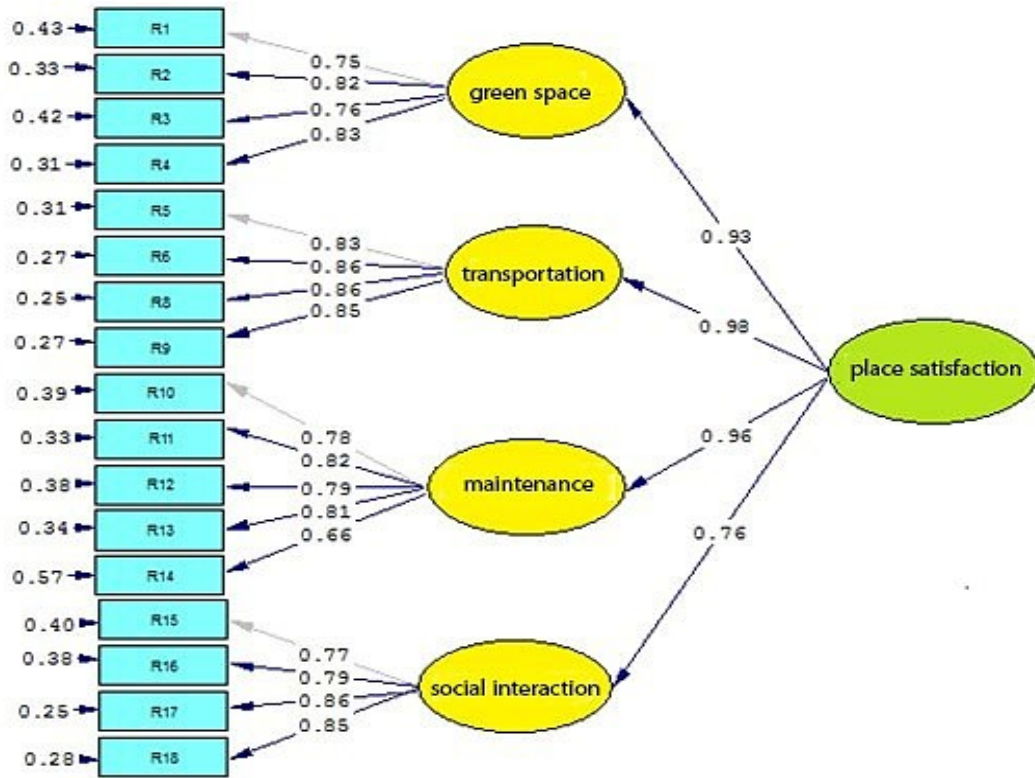
**Table 1.** Measurement model results for the latent constructs

Construct	Items	Loadings	Composite reliability (CR)	t value	Average avriance extracted (AVE)
Landscape design (first-order)	LD1	0.68	0.89	6.10	0.50
	LD2	0.73		6.97	
	LD3	0.68		9.81	
	LD4	0.68		9.84	
	LD5	0.64		9.05	
	LD6	0.76		10.92	
	LD7	0.72		12.76	
	LD8	0.76		13.86	
Perception of safety (first-order)	PoS1	0.64	0.91	11.62	0.59
	PoS2	0.79		15.48	
	PoS3	0.75		14.37	
	PoS4	0.83		16.60	
	PoS5	0.81		16.14	
	PoS6	0.82		16.47	
	PoS7	0.71		13.03	
Place satisfaction (second-order)	Green space	0.93	0.95	13.54	0.83
	Accessibility	0.98		17.25	
	Maintenance	0.96		14.74	
	Social relations	0.76		11.54	
Place attachment (first-order)	PA1	0.78	0.91	14.53	0.50
	PA2	0.68		11.96	
	PA3	0.62		10.75	
	PA4	0.66		11.60	
	PA5	0.66		11.80	
	PA6	0.73		10.90	
	PA7	0.77		9.72	
	PA8	0.74		9.01	
	PA9	0.69		10.48	
	PA10	0.74		9.23	

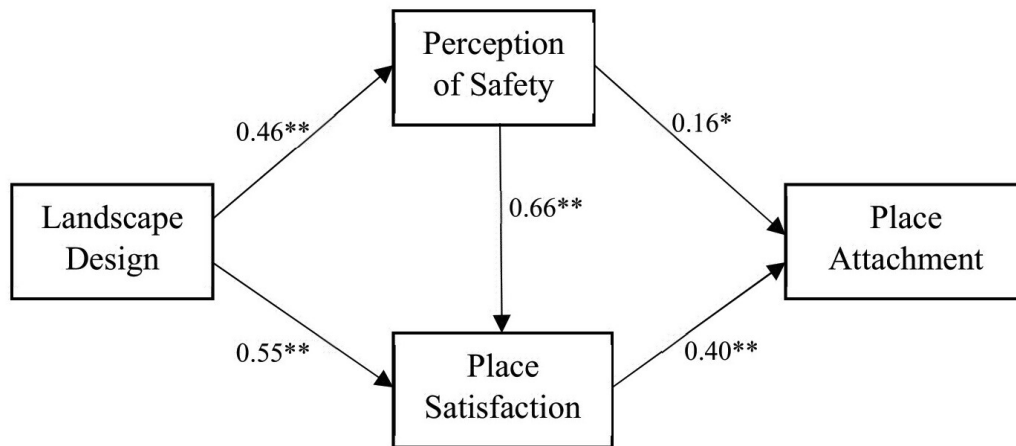
Notes: All t-values are significant at  $p < 0.01$ .

**Table 2.** Goodness of fit indices of CFA results

Construct	$X^2/df$	AGFI	NFI	GFI	CFI	RMSEA
Landscape design	1.17	0.96	0.98	0.98	1.00	0.055
Perception of safety	1.78	0.95	0.95	0.98	1.00	0.053
Place satisfaction	1.84	0.92	0.96	0.94	0.97	0.055
Place attachment	1.86	0.92	0.97	0.95	0.98	0.056



**Fig. 2** Results of the second-order CFA for place satisfaction construct



**Fig 3.** Structural model of the study. Note: \*\*  $p < 0.01$ , \*  $p < 0.05$ .

This study aims to evaluate the effect of landscape design on place attachment by examining the mediating roles of perception of safety and place satisfaction using SEM. **Table 3** indicates the coefficients of direct,

indirect and total effects, as explained by the variance and significance of variables. The numbers in the parentheses are t-values. In **Table 3**, the effects of landscape design on perception of safety ( $\beta=0.46$ ,

**Table 3.** Hypothesis testing (the mediating relationships)

Hypothesis	Relationship	Indirect effect ( $\beta$ )	<i>t</i> value	Decision
H6	LD→PoS→PA	0.08**	3.01	Supported
H7	LD→PS→PA	0.23**	3.94	Supported
H8	LD→PoS→PS→PA	0.41**	4.87	Supported

Note: \*\*  $p < 0.01$ , LD is landscape design, PoS is perception of safety, PS is place satisfaction, and PA is place attachment.

$p < .01$ ) and place satisfaction ( $\beta = 0.55$ ,  $p < .01$ ) are significant and positive. In addition, the effects of perception of safety on place satisfaction ( $\beta = 0.66$ ,  $p < .01$ ) and place attachment ( $\beta = 0.16$ ,  $p < .05$ ) are significant and positive. Finally, the direct effect of place satisfaction on place attachment was significant and positive ( $\beta = 0.40$ ,  $p < .01$ ). The results support H1 to H5.

The result of the indirect effect implies that the effects of landscape design on place attachment are positive and significant through place satisfaction and perception of safety ( $\beta = 0.41$ ,  $p < .01$ ). Although not hypothesised, the results indicated that the indirect effect of perception of safety on place attachment through place satisfaction is positive and significant ( $\beta = 0.26$ ,  $p < .01$ ). Furthermore, the indirect effect of landscape design on place satisfaction through perception of safety is positive and significant ( $\beta = 0.30$ ,  $p < .01$ ). Therefore, the findings provide support for H6–H8.

The results further shows that the model accounts for 21%, 73% and 19% of variance in perception of safety, place satisfaction and place attachment, respectively. The final model indicates acceptable goodness of fit indices (RMSEA = 0.049, CFI = 0.99, GFI = 0.94, NFI = 0.98 and AGFI = 0.91). These indices suggest that the data are well fitted to the model.

## DISCUSSION AND CONCLUSION

The main goal of this study was to test a model that evaluates the relationship between landscape design and place attachment by considering the mediating roles of perception of safety and place satisfaction. The study was conducted in Penang, Malaysia. Eight research hypotheses were advanced and tested using the SEM on a priori hypothesised conceptual model. The results indicated the validity and reliability of the proposed model, thereby showing that landscape design has a significant positive effect on place satisfaction among residents. Therefore, landscape design affects residents' satisfaction by creating or developing a basis for residents' meditation, relaxation, and physical activities. Furthermore, previous studies revealed that open spaces and their quality encourage the residents to develop their social interactions and will consequently increase the level of natural surveillance

in the neighbourhoods (Hedayati Marzbali *et al.*, 2021).

With regard to the second hypothesis, the results indicated that landscape design has a significant positive effect on the perception of safety. The result can be explained by the fact that the visual and human proportions of the landscape design provide harmony and discipline, and then the residents feel comfort when they use the neighbourhoods' open spaces and parks. With more use of parks and open spaces, the perception of safety will be higher, and residents will be more satisfied in the neighbourhoods, which is consistent with previous studies (Maghsoodi *et al.*, 2021; Turner, 2014). Consistent with previous studies, the results in this study imply that landscape design, which involves well-maintained landscaping and provides appropriate lighting, can help increase perception of safety amongst residents (Verbrugge and van den Born, 2018).

The third hypothesis refers to the effect of perception of safety on place satisfaction, which was supported by the study findings. To explain this finding, studies demonstrated that an important measure for increasing satisfaction with the place is to provide safety (Ulusoy *et al.*, 2013), consequently the perception of safety is one of the main priorities amongst the residents for living in the neighbourhoods (Hedayati *et al.*, 2017). Moreover, it is one of the high-ranked indicators to assess the QoL in the cities. This result is consistent with Grum (2017), wherein residents will obtain a higher level of satisfaction when they are in a maintained and safe place.

The findings also supported the hypothesis that perception of safety has a significant effect on place attachment. Therefore, residents with a higher perception of safety have a higher attachment to that neighbourhood. Similar to previous studies, the findings generally showed that declining the safety level of a neighbourhood can reduce the residents' attachment to the neighbourhood and increase their shifting to new development neighbourhoods (Isa *et al.*, 2021). Thus, the old neighbourhood will be uninhabitable and lead to reduced population, place identity, public participation and sense of belonging in the neighbourhood (Farhad *et al.*, 2021).

The result showed that place satisfaction has a positive relationship with place attachment. To explain



this finding, residents with a higher level of satisfaction to the neighbourhood have a higher level of attachment to the neighbourhood. Same with previous studies, the results demonstrated that improving the quality of the neighbourhoods can increase residents' satisfaction with the neighbourhoods, and a higher level of satisfaction causes residents to have more attachment to the neighbourhoods (Di Masso *et al.*, 2014; Maghsoodi *et al.*, 2021).

The findings demonstrated that the perception of safety and place satisfaction mediates the relationship between landscape design and place attachment. The findings indicated that landscape design on place attachment is mediated by the residents' satisfaction and perception of safety. The current result is consistent with previous studies (Charkhchian, 2009). However, the current study results showed that residents' satisfaction mediates the relationship between the perception of safety and place attachment. Therefore, the landscape design contributes to the increased perception of safety amongst residents and will increase place satisfaction and place attachment consequently. This instance is very interesting because landscape design can affect place attachment among residents even in a multi-racial community as the study area.

The study has practical implications for professional bodies. The results of this work will unravel and shed light on the understanding of the physical aspects of living areas on residents' perceptions and their interactions within the neighbourhood environment. In conclusion, the study emphasised the role of landscape design on the perception of safety, place satisfaction and place attachment within residents. Therefore, multi-aspects of the neighbourhood, such as aesthetics, colour combination and visual views, must be considered by designers and planners to encourage residents to use open spaces. The results of this study can be used by authorities and urban managers to improve the strategies and policies towards increasing perception of safety, place satisfaction, place attachment and eventually QoL in vulnerable neighbourhoods of the cities.

This study provides avenues for future research. This study examines only one neighbourhood. Therefore, the results are limited to middle-class neighbourhoods. This limitation should be anticipated and addressed in the future by focusing on more than one neighbourhood to have some comparisons amongst the neighbourhoods at different classes. A prevailing tendency considers the neighbourhood as the main level of analysis of landscape design and satisfaction. However, future investigations should dedicate more

attention in exploring the spatial distribution characteristics that influence landscape patterns by considering the social and cultural components of neighbourhoods and making comparisons amongst different landscape patterns for open spaces in the neighbourhood.

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