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PERCEPTION OF SAFETY AND OUTDOOR PHYSICAL ACTIVITY AMONG STUDENTS IN UNIVERSITY CAMPUSES: DOES PLACE ATTACHMENT MATTERS?

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Abstract

Gaining insight into how people view their daily routines and engage with their surrounding environments is critical in shaping decisions regarding outdoor physical activity. This research investigates a framework for the direct and indirect effects of students' perceptions of their university surroundings on their participation in outdoor physical activities. A total of 269 students participated in this study. Findings reveal that place attachment may mediate the relationship between safety perception and outdoor physical activity. This study suggests that universities should enhance students' living environments by adopting safe environmental designs. Campus planning schemes should provide facilities that foster place attachment and encourage social interactions.

Keywords: University Campus Environmental Design, Place Attachment, Outdoor Physical Activity

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INTRODUCTION

The advantages of physical exercise in reducing health risks are extensively documented, as are its positive effects on mental health (Da Silva et al., 2012; Ghadzlie et al., 2024; Gordon et al., 2018; Lee, 2003; Löllgen et al., 2009; Paffenbarger Jr et al., 2001; Sigal et al., 2006). Interest in the role of the built environment in promoting physical activity is growing, with researchers assessing activity levels within these spaces (McCormack & Shiell, 2011; Safizadeh et al., 2024). A safe built environment fosters physical activity (Alshahrani, 2024; Annemans et al., 2024; Safizadeh et al., 2024).

Crime and feelings of insecurity can discourage physical exercise, resulting in reduced participation in outdoor activities because of a diminished perception of safety (Constable Fernandez et al., 2023). Thus, creating built environments that encourage physical activity is regarded as a sustainable strategy for health promotion (Annemans et al., 2024; McCormack & Shiell, 2011). However, previous studies examining the connection between safety perception and physical activity have produced inconsistent results (Bracy et al., 2014; De Dominicis et al., 2015; Wilson et al., 2004). The relationship between safety perception and outdoor physical activity is influenced by a mix of factors, such as social environment characteristics, building environment traits and individual factors (Foster & Giles-Corti, 2008). Only a few studies offer insightful recommendations for the design and development of outdoor physical spaces (Wang et al., 2016).

Using an ecological model to study diverse influences on physical activity is beneficial (Bracy et al., 2014). University students face numerous obstacles to physical activity in multiple areas: psychological, emotional and cognitive factors (time limitations and diminished motivation); environmental factors (shortage of accessible facilities) and socioeconomic and demographic factors (insufficient financial means) (Silva et al., 2022). Place attachment, a psychological aspect influenced by interactions with the environment, correlates with outdoor physical activity (Nursyamsiah & Setiawan, 2023). Previous research has explored this relationship, suggesting that attachment to specific outdoor spaces may motivate individuals to maintain physical activity routines (Koohsari et al., 2023; Lee & Shen, 2013).

This research focuses on investigating how perception of safety in university campus environment characteristics, along with objectively measured and subjectively perceived place attachment, influences outdoor physical activity among Malaysian university students.

Malaysia ranks among the 10 most sedentary nations in Asia, with the World Health Organization reporting that 61.4% of Malaysians aged 15 and over lack of exercise (Thijssen et al., 2010). Little information is available about obstacles to physical exercise among university students in Malaysia. The

country has five public universities, and science students participate in field excursions and intensive laboratory sessions more than art students do. Most students at Universiti Sains Malaysia (USM) lack physical activity and exhibit high sedentary behaviour (Silva et al., 2022).

The main purpose of this study is to evaluate the connection between outdoor physical activity on the USM campus and students' perceptions of safety, in an effort to address the gaps in previous research. Furthermore, this study assumes that place attachment mediates the connection between outdoor physical activity and safety perception. The study's key points are elaborated in the subsequent sections.

LITERATURE REVIEW

Perception of Safety and Place Attachment

Numerous studies have demonstrated the connection between individuals' perception and assessment of a place and their attachment to it. Place attachment is influenced by one's perception of safety. Place attachment in public open spaces refers to the connection that individuals have with their physical surroundings and their perception—whether negative or positive—of the location (Karsono & Shindi Indira, 2016). A strong emotional connection to a place may make one feel protected and encourage them to ignore any risks (Armaş, 2006). The need for safety and security drives place attachment (Han et al., 2023). According to Hester (2013), place attachments arise from the desire to fulfil fundamental needs like security, but this desire may be overshadowed by competing 'monsters', like fear of crime. If these fears are unacknowledged, they can obscure the significance of place attachment and its role in place-making (Manzo & Devine-Wright, 2013). Several studies have identified the perception of safety in the surrounding environment as a key positive indicator of place attachment (Lewicka, 2010; Nursyamsiah & Setiawan, 2023).Thus, the perception of safety affects individuals' activity levels and walking rates. Environments perceived as safe are associated with high walking rates (Bracy et al., 2014; Saelens & Handy, 2008).

Place Attachment and Outdoor Physical Activity

Place attachment describes the deep bond individuals form with the places they live in, encompassing functional and emotional aspects that imbue meaning into their environment (Chang et al., 2023; Dallago et al., 2009; Han et al., 2023; Karsono & Shindi Indira, 2016; Madkhali et al., 2024). When individuals form a strong bond with particular places, such as their neighbourhoods, they are motivated to engage in regular outdoor exercise routines (Han et al., 2023; Koohsari et al., 2023). Some studies have found a positive link between strong place attachment and outdoor physical activities, such as walking (Chang et al.,

2023; Koohsari et al., 2023; Lee & Shen, 2013; Madgin et al., 2016). This finding indicates that the emotional connection individuals feel towards their surroundings can influence their engagement in physical activities within those spaces.

Perception Of Safety, Place Attachment and Outdoor Physical Activity

Adults and adolescents, especially women, report lack of safety as a deterrent to using outdoor spaces and participating in physical exercise (Baran et al., 2014). Current findings on the primary effects of safety perception variables are inconsistent (Bracy et al., 2014; De Dominicis et al., 2015). Place attachment controls interactions between individuals and their surroundings in several pertinent environmental–psychological processes. However, disagreement exists over its role in mediating the connection between perceived environmental dangers and coping strategies. Place attachment is hypothesised to mediate the connection between safety perception and outdoor physical activity because it is closely tied to personal identity and
may be associated with spatial preferences (Dominicis et al., 2015).

H1: A positive relationship exists between perception of safety and place attachment.

H2: A positive relationship exists between place attachment and outdoor physical activity.

H3: A positive relationship exists between perception of safety and outdoor physical activity

H4: Place attachment mediates the relationship between perception of safety and outdoor physical activity.

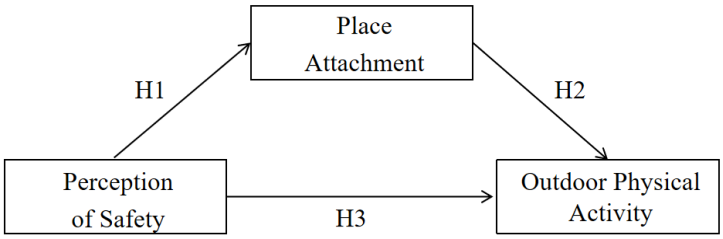

Figure 1: The Conceptual Pathway Between the Study Variables
Source: Author's Summarize

RESEARCH METHODOLOGY

Site Selection

This study is part of a larger project examining the relationship between campus-built environments and health rates. In Malaysia's four public university campuses, several unsecured locations, such as roads, walkways and parking areas, are the riskiest (Figure 2) (Abd-Razak et al., 2011). According to reports,

campus crime primarily includes violent and property crimes (Cundiff, 2021; Nobles et al., 2013; Woolnough, 2009). Property offenses include burglary, theft and car theft, whereas violent offenses involve aggravated assault, robbery, homicide or non-negligent manslaughter and forcible rape (Cundiff, 2021). Security issues are the main cause of crime at USM's main campus (Omar & Cusairi, 2018).

The crime index (Table 1) is refined with the university's security department to reflect relevant crimes on the USM campus, including violent and property crimes, from 2021 to 2023. Studies have shown that criminal activity often clusters in specific geographic areas known as 'crime hot spots' (Eck et al., 2015; Sherman, 1995; Sherman et al., 1989; Sherman & Weisburd, 1995; Weisburd & Eck, 2004). USM's crime index identifies these hotspots (Figure 3).

This study concentrated on the core region of USM, a crime hotspot with the highest burglary rates. As part of a larger project, this study utilised probability sampling in public areas. Prior to data collection, respondents were informed about the research and asked to scan a QR code to ensure they were USM students familiar with the area and regular visitors. The eligibility criteria included students across all academic levels (undergraduate, graduate and PhD) residing on or off campus and utilising any mode of transport to campus (car, walking, bicycle and bus).

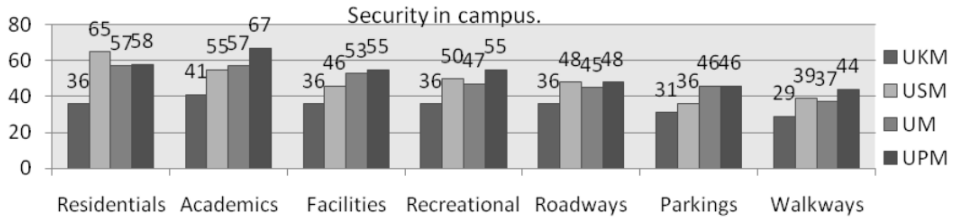

Figure 2: Students' Feedbacks on Security Level in Their Campuses
Source: Abd-Razak et al (2011)

Table 1: The USM Crime Index

Crime Type	Crime Index
Violence Crime	Causing Injury
	Others Theft
Property Crime	Housted breaking-in & Theft
	Careless Theft

Source: USM Security Department, 2024

Figure 3: Crime Hot Spots
Source: The authors based on the crime data taken from USM Security Department (2024)

Survey Instrument

This research used a cross-sectional design conducted on a university campus, employing a quantitative method in which participants completed a series of survey questionnaires. Even though its main goal is not theory development, the study took an exploratory approach to gain insights into the direct and indirect linkages between safety perception and physical activity on university campuses. Structural equation modelling was used to empirically evaluate the theorised variables and relationships.

A pilot survey was conducted with a random selection of 36 respondents. The construct reliabilities were all deemed satisfactory, with the SPSS results showing Cronbach's alpha (α) values ranging from 0.732 to 0.943, which exceeded the 0.70 threshold for reliability. The final questionnaire comprised 27 items, categorised as follows: nine items on respondent

demographics, four items on physical activity adapted from IPQA (2002), six items on the perception of safety adapted from Fernandez (2005) and Starkweather (2007) and eight items on place attachment adapted from Williams and Vaske (2003) and Xu et al. (2015). Responses were evaluated using a five-point Likert scale, with ratings ranging from 1 for 'strongly disagree' to 5 for 'strongly agree', except for outdoor physical activity.

RESULTS

Respondent Profiles

A total of 269 respondents participated in the study. The average age of the respondents is 26 years (SD=5.479). Of these respondents, 62.5% are female, and 37.5% are male. Chinese make up 55% of the sample, followed by Malay (25.7%), Indians (7.1%), Malaysian Chinese locals (5.2%) and individuals from the Middle East (7%). In terms of educational attainment, 42.4% are pursuing an undergraduate degree, 31.2% a PhD degree 26.4% a master's degree. Regarding monthly earnings, 55.4% of respondents earn less than RM1000, 41.6% earn between RM1001 and RM2000, 0.4% earn between RM 3001 and RM4000 and 0.4% earn RM5001 and above.

Measurement Model Results

Construct validity was assessed using convergent validity and discriminant validity (Hair et al. 2007). Four methods were employed to evaluate convergent validity (Table 2): factor loading, Cronbach's α, composite reliability (CR) and average variance extracted (AVE). Hair et al. (1998) suggested using a cross-loading cut-off value of 0.4 to assess how well each item represents its corresponding latent variable. The results indicate no multiple cross-loadings on any of the items, supporting initial discriminant validity. An AVE value of 0.5 or above indicates sufficient convergence (Bagozzi & Yi, 1988). A CR rating of 0.7 or above is recommended because it indicates strong dependability. The CR values in this study range from 0.867 to 0.945, well above the cut-off point.

Overall, the measurement model shows adequate reliability and convergent validity based on parameter estimates and statistical significance, suggesting that all items are reliable measures of their respective constructs. Every factor's Cronbach's α score is higher than the suggested cut-off value of 0.7 (Nunnally, 1978), with values ranging from 0.694 to 0.924, which show high scale reliability.

Table 2: Reliability and Convergent Validity Results

Variable	Item	Loading	Alpha (α)	CR	AVE
Place Attachment	PA1	0.900	0.923	0.945	0.812
	PA2	0.896			
	PA3	0.925			
	PA4	0.887			
	PA5	0.919	0.915	0.940	0.796
	PA6	0.893			
	PA7	0.861			
	PA8	0.901			
Perception of Safety	POS1	0.614	0.876	0.908	0.624
	POS2	0.761			
	POS3	0.818			
	POS4	0.853			
	POS5	0.840			
	POS6	0.842			
Outdoor Physical Activity	OPA1	0.871	0.694	0.867	0.766
	OPA2	0.879			
	OPA3	0.919	0.798	0.908	0.831
	OPA4	0.904			

Source: Author's Calculation

Table 3: Results of HTMT Ratios

	Jog	Perception of Safety	Place Dependency	Place Identity	Walking
Jog					
Perception of Safety	0.139				
Place Dependency	0.11	0.418			
Place Identity	0.119	0.559	0.803		
Walking	0.375	0.146	0.268	0.194	

Source: Author's Calculation

Structural Model Results

Path analysis was conducted to evaluate the four hypotheses formulated for this study. After validating the model through the outer model assessment, the inner model estimates were examined to assess the proposed relationships between the constructs in the conceptual model (Hedayati et al., 2019). Researchers can test their proposed model easily when they have evidence of the inner model's quality, as demonstrated by the significance levels and standardised path coefficients (Hair et al., 2012). The relationship between POF and PA is positive (β=0.519, p<0.01). The idea that improving the campus public spaces may

enhance students' attachment to these places is supported by previous research on the relationship between safety perception and place attachment (Lewicka, 2010; Nursyamsiah & Setiawan, 2023).

Table 4: Results of Path Coefficient and Hypothesis Testing (Direct and Indirect Effects)

Hypothesis	Relationship	β	T	P	f^2	Decision
H1	POF→PA	0.519	10.626	0	0.291	Supported
H2	PA→OPA	0.168	2.109	0.035	0.018	Supported
H3	POF→OPA	0.077	0.887	0.375	0.004	Not supported
H4	POF→PA→OPA	0.087	1.978	0.048		Supported

Source: Author's Calculation

Table 4 presents the results of the path analysis conducted to assess the direct effects between latent variables. A positive and significant effect of POF on PA (H1; β=0.519, p<0.01) is observed. This finding suggests that a strong place attachment is reported by people with high perceptions of safety.

H2 posits that a strong place attachment positively influences and significantly increases engagement in outdoor physical activity (H2; β=0.168, p<0.05). Consistent with previous research, the findings indicate that students with a strong place attachment to their surroundings are likely to participate in outdoor physical activities. However, no meaningful correlation is found between outdoor physical exercise and perception of safety (H3; β=0.077, p＞0.05). Therefore, the results support H1 and H2 but not H3. The R^2 value is 0.039 for outdoor activities. This study demonstrates the discrepancy between perception of safety variables and outdoor physical engagement—a pattern also noted in other studies (Bracy et al., 2014).

Our research analysed the mediating role of place attachment in the connection between perception of safety and outdoor physical activity. Using the specific indirect effect from the PLS output and a bootstrapping approach with 5,000 samples, as recommended by Hayes (2009), the indirect effect's t-value was calculated. The findings indicate that t-value is statistically significant at 0.05, thus supporting H4.

The aim of determining the effect size (f^2) is to evaluate the effect of an independent latent variable on a dependent variable. Changes in the coefficient of determination (R^2) are used to calculate effect size. Chin (1998) stated that the levels of effect size at 0.02, 0.15 and 0.35 correspond to small, moderate and substantial effects, respectively. According to Table 4, the f^2 values for outdoor physical activity and perception of safety related to place attachment are 0.018 and 0.289, respectively. As a result, perception of safety (f^2＞0.15) has a

moderate effect on place attachment, whereas place attachment ($f^2 < 0.02, f^2 > 0$) has a small effect on outdoor physical activity (Al Mamun & Fazal, 2018).

An assessment was conducted to detect multicollinearity among the model variables. None of the variance inflation factor values, as shown in Table 6, exceed the suggested threshold of 5.00, indicating no cause for concern (Hair et al., 2014). Hair et al. (2017) suggested evaluating the predictive correlation of the model through the blindfolding procedure. The Q^2 values for place attachment (Q^2=0.153) and outdoor physical activity (Q^2=0.013) are greater than 0, meaning the model has sufficient predictive significance.

DISCUSSION

Our research investigates a conceptual model examining the connection between perceived built environment, particularly safety perception, and outdoor physical activity, with place attachment as a mediator. The findings reveal no significant relationship between safety perception and outdoor physical activity, aligning with the results of previous research (Bracy et al., 2014; De Dominicis et al., 2015). However, safety perception positively influences place attachment, and place attachment positively influences outdoor physical activity. Place attachment mediates the relationship between safety perception and outdoor physical activity. The research emphasises the important influence of the built environment in shaping students' place attachment and activity choices. Neglecting the physical environment can lower perceptions of safety, reduce place attachment and decrease outdoor activity. These findings highlight the significance of the outdoor space in fostering active and connected communities.

CONCLUSIONS AND DIRECTIONS FOR FUTURE RESEARCH

This research provides valuable insights into understanding campus environmental safety design. It reveals that students' perception of safety significantly influences their place attachment, which in turn correlates with increased outdoor physical activity. The practical implications for USM's environmental design underscore opportunities to enhance livability. Recommendations include implementing safety-focused environmental design methods and enhancing facilities to foster place attachment and social interactions within USM's planning schemes.

Despite these contributions, several limitations present possibilities for further investigation. Firstly, this study focused solely on an educational institution in a developing country. Although the study region represents the typical university environmental design in Penang, Malaysia, the conclusions may not apply to other educational institutions in industrialised nations. Secondly, given the inconsistent findings in the literature on the relationship between safety perception and outdoor physical activity, results may vary if

outdoor physical activity is replaced with other environmental factors, such as residential settings. Thirdly, the f^2 for the relationship between place attachment and outdoor physical activity is weak in this study. Future research can explore additional variables, such as environmental aesthetics and crime prevention through environmental design, to strengthen this relationship. Furthermore, the observed conflicts in this study highlight the potential moderating effects, such as gender difference, on the connection between physical environment and outdoor physical activity. Using this methodology, future studies should evaluate how demographic characteristics affect the relationships in the study.

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