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**PERCEIVED NEIGHBOURHOOD BUILT ENVIRONMENT AND
PHYSICAL ACTIVITY FOR LEISURE PURPOSES: THE
MODERATING EFFECTS OF NEIGHBOURHOOD
SOCIOECONOMIC STATUS**

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Abstract

Sedentary lifestyle is a persistent issue in Malaysia, contributing to the country's rising obesity rate. Evidence throughout the years has highlighted that built and social environments are significant factors of physical activity; however, the estimation of those factors is seldom approached in Malaysia. As such, this paper examines the association between perceived neighbourhood-built environment (PNBE) and physical activity for leisure purposes (PAL) among urban Malaysian adults, moderated by neighbourhood socioeconomic status (NSES). Urban residents of higher- and lower-NSES in Johor Bahru city (n=256) were approached through stratified random sampling. The PNBE factors included were residential density, walking and cycling facilities, surrounding aesthetics, as well as safety from traffic and crime. Multi-group moderator analysis revealed that the construct of PNBE is significantly different across areas of higher- and lower NSES ($p = 0.017$, 95% CI). The findings contribute to health-oriented urban planning, highlighting the importance of integrating both aspects of built and social environments when designing neighbourhood interventions to promote active living.

Keywords: Perceived neighbourhood-built environment, Leisure purpose physical activity, Neighbourhood socioeconomic status

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INTRODUCTION

The role of the environment in shaping human behaviour has long been recognised (Bronfenbrenner, 1979). Building on this, Sallis, Owen and Fisher (2015) suggested that prolonged exposure to physical, social, and political environments can influence individuals' health behaviours. A particular health behaviour of interest in this paper is physical activity for leisure purposes (PAL). As ascertained by Høyer-Kruse, Schmidt, Hansen & Pedersen (2024), physical activity is a key element to combating not only chronic diseases, but also non-communicable diseases, which then ultimately helps in improving population health. However, despite growing attention and acknowledgement to this understanding, physical inactivity remains a growing global concern, with prevalence increasing from 27% in 2022 to 31% in 2024, placing the world off track to meet the targets of the Global Action Plan on Physical Activity 2018–2030 (World Health Organization, 2018, 2024). Unfortunately, this proportion is concurrent with Malaysia, where, based on the country's National Health and Morbidity Survey 2023, it was discovered that approximately 30% of Malaysian adults engage in insufficient physical activity (Institute for Public Health, 2023). In other words, 1 in 3 people are physically inactive. Studies among Malaysian adults further show that physical inactivity is more prevalent among individuals with chronic conditions, disabilities, and prolonged sedentary lifestyles, which highlights the significant influence of socio-environmental factors on physical activity levels (Lim et al., 2025). These studies show that there is a need for targeted understandings and interventions when promoting active lifestyles among Malaysians.

Supported by numerous accounts, the socio-environmental factor represented by neighbourhood socioeconomic status (NSES) is studied as an underlying construct in influencing physical activity as exemplified by studies from different localities among populations from Australia (Owen et al., 2007), the Netherlands (Zhu et al., 2021), Sweden (Sundquist et al., 2011), the United States of America (Sallis et al., 2018) and Belgium (D'Haese et al., 2014). The mixed findings across previous studies suggest that the moderating role of NSES is context-dependent, warranting further investigation within the Malaysian setting. Additionally, in a scoping review published by Høyer-Kruse, Schmidt, Hansen & Pedersen (2024) which scrutinised a total of 72 papers relating to exploring patterns in physical activity participation within varying social environments with specific focus in looking at socio-economic status, only five papers originate from Asia. This further solidifies the fact that the variables of interest in this paper are understudied in the said region.

Examining the moderating role of NSES in Malaysia provides valuable insights into potential health disparities between communities of differing socioeconomic conditions. As suggested by Sallis (2009) in Van Dyck et al.

(2009), NSES should be considered in place-based public health research because health behaviours are shaped by both physical and social environments. Incorporating these dimensions offers a more comprehensive understanding of physical activity behaviours and their underlying determinants. Such evidence can better inform health-oriented urban planning policies (Lim, et al., 2023) by enabling interventions that are responsive to local socioeconomic contexts and more effective in promoting active lifestyles and reducing health inequalities. Therefore, the current study aims to generate empirically grounded insights into how neighbourhood-built environment characteristics can be strategically shaped to enhance PAL among urban Malaysian adults, accounting for socioeconomic differences and socio-demographic contexts. Within this context, two study objectives were established; (i) to examine the relationship between perceived neighbourhood-built environment (PNBE) attributes and PAL among urban Malaysian adults; (ii) to assess the moderating effect of NSES on the relationship between PNBE and PAL, to identify differential influences across socioeconomic groups.

LITERATURE REVIEW

Studies interested in the effects of the built environment attributes oftentimes found itself measuring the said variable either objectively or subjectively, or both. It is not surprising as both methods are widely recognised as valid approaches in understanding the connection between the living environment and human behaviours. Built environments measured objectively typically involves in quantifying the physical attributes of the spatial environment using geographic information systems and environmental audits (Li, Winter, Milburn & Padgett, 2021; Yu, Lin & Chen, 2025). The common characteristics captured can include but not limited to development density, land use zoning composition and distribution, connectivity as well as accessibility to places of interest respective to the studies. By contrast, the subjective perceived built environment quantifies a targeted population's lived experience by asking them to report their evaluations of their environments. This can include the perceived safety and security, accessibility to-and-fro destinations, and aesthetics of their surroundings; which oftentimes cannot be fully captured nor measured through objective assessments (Kent et al., 2017; Zhang & Mu, 2020).

While both approaches have been explored and utilised quite extensively, there is growing evidence that suggests that the subjectively perceived built environment is more direct in shaping individual behaviours and experiences (Zhang et al., 2024; Wei et al., 2024). It is argued this way purely due to the understanding that human actions are often guided not by the objective reality of the environment, but by how individuals interpret and respond to it. For instance, perceptions of safety, comfort, and attractiveness can significantly

influence whether individuals choose to engage in activities such as walking or recreational exercise, regardless of the objectively measured availability of facilities (Zhao et al., 2019). Similarly, perceived environmental qualities have been shown to have stronger associations with subjective outcomes such as happiness and neighbourhood satisfaction than objective measures alone (Kent et al., 2017; Lee et al., 2017).

Furthermore, discrepancies across objective and perceived measures are frequently observed, highlighting that the presence of infrastructure does not necessarily translate into its utilisation. For example, objectively walkable environments may still be underutilised if residents perceive them as unsafe or unattractive. Conversely, individuals may report higher levels of satisfaction and engagement in environments that may not score highly on objective indicators but are perceived positively due to personal or contextual factors (Zhang & Mu, 2020; Ye & Titheridge, 2017). As such, the study adopted perceived measures in order to gauge insights into how these environments are experienced and acted upon by individuals. It is thought that perception-based assessments may be more effective in explaining everyday behavioural patterns, particularly those related to PAL.

The World Health Organization conceptualises physical activity as a multidimensional construct undertaken across several domains, including activities exerted during work, while travelling through and from destinations, leisure-time, and sedentary behaviour (Bull et al., 2020). These domains differ fundamentally in their underlying context and motivations. Work and travelling-related activities are often utilitarian and necessity-driven, whereas leisure-time physical activity is discretionary and shaped by personal choice, preferences, and environmental affordances (Quinn, 2023). Consequently, while total physical activity captures overall energy expenditure, domain-specific measures provide a more nuanced insight into behavioural patterns and the contextual influences that shape activity engagement.

Physical activity for leisure purposes (PAL) is particularly important as it reflects voluntary engagement and intrinsic motivation, making it more sensitive to environmental and psychological influences compared to other domains. Unlike occupational or transport-related activity, which may be constrained by work demands or accessibility needs, PAL is largely influenced by individual perceptions, preferences, and perceived opportunities within the built environment. Empirical evidence suggests that PAL is more conducive to positive health outcomes, including mental well-being and provides better protection against chronic diseases, compared to other types of physical activity that may not yield equivalent benefits due to their obligatory or repetitive nature (Teno et al., 2024). This distinction reinforces the relevance of focusing on PAL when examining how environmental factors translate into behavioural outcomes.

Furthermore, PAL serves as a critical indicator of how individuals interpret and respond to their surrounding environment, thereby offering a closer reflection of behavioural intention and agency. Because participation in PAL is discretionary, it is more directly shaped by perceived environmental qualities such as safety, accessibility, and aesthetics, which align closely with the concept of perceived neighbourhood-built environment. This makes PAL particularly valuable in urban management research, as it captures the extent to which planning interventions successfully translate into meaningful behavioural change. As such, isolating PAL enables a more precise understanding of how built environment interventions can foster active lifestyles at the individual level, beyond structural or necessity-driven forms of physical activity.

Residential density has been linked to PAL, although its influence is often shaped by context. In higher density neighbourhoods, it can support closer proximity to parks and recreational spaces, which encourages leisure walking and outdoor activities (Müller et al., 2024). However, Nigg et al. (2024) suggest that when density becomes too high, it may limit access to open spaces and reduce opportunities for recreation. Studies suggest that a balanced level of density is more supportive of PAL, as it provides both accessibility and liveable space for activity. Facilities for walking or cycling play a key role in supporting PAL by providing dedicated and safe spaces for movement. The presence of active living infrastructure, including pedestrian walkways and cycling lanes, reduces barriers and increases comfort to encourage more users (You et al., 2023). Empirical findings by Müller et al. (2024) indicate that individuals living in areas with better walking and cycling facilities are more likely to participate in leisure-based physical activities.

The perception and experience of people regarding their environment is oftentimes shaped by their surroundings' aesthetics. As put forth by You et al., (2023), supported by Zhong et al. (2024), visually appealing surroundings, such as an abundance of greenery and well-maintained spaces, enhance spatial enjoyment and encourage individuals to spend more time outdoors. Traffic and crime safety are quite critical in influencing whether individuals feel comfortable engaging in PAL. Even when infrastructure is available, concerns about traffic hazards, air pollution (Leh et al., 2011) or personal safety can discourage outdoor activity. Evidence shows that safer neighbourhoods, both in terms of traffic conditions and perceived crime, are more likely to support higher levels of PAL by reducing fear and increasing confidence in using public spaces (You et al., 2023; Yu et al., 2025).

As for neighbourhood socioeconomic status, it crucially moderates how the built environment attributes influence PAL. Individuals living in higher socioeconomic neighbourhoods are often found to be benefitting from better-quality infrastructure, accessible recreational public realms, and safer

environments, strengthening the positive effects of the environment on physical activity (Müller et al., 2024). In contrast, Yu et al. (2025) found that in lower socioeconomic settings, even well-designed physical environments may not translate into increased PAL due to constraints including but not limited to safety concerns. As such, NSES does not merely act as a background characteristic but actively conditions the relationship of the built environment and PAL, highlighting the need for this study.

METHODS

Study Area, Subjects and Sampling

Despite being one of Malaysia's fastest-growing urban cities, Johor Bahru, Johor has received less attention as compared to Klang Valley, especially in studies relating to uncovering urban obesogenic environment. As such, this leaves a geographical gap in understanding how obesogenic environments operate in other rapidly urbanising cities. Moreover, Johor Bahru provides a valuable setting for extending the evidence base beyond the Klang Valley where it experiences rapid urban expansion, increasing motorisation rate, and proximity to its neighbouring city-state, Singapore. Coffee et al. (2013) attested that housing property holds the highest value in terms of asset for a person, therefore, it is significantly associated to predicting socio-economic status. Employing this understanding, all neighbourhoods in the district of Johor Bahru were categorised into either “higher NSES” (higher than RM434) or “lower NSES” (lower than RM434) based on the neighbourhood areas’ average transaction prices, as well as the median housing price per square foot of the said area reported by Malaysia’s Valuation and Property Services Department. During data collection, the median housing price was RM434. Next, by using simple random sampling, 21 lower NSES and 22 higher NSES were chosen.

The sample size calculation of this study was calculated using *a priori* sample size calculation for Structural Equation Models put forth by Cohen (1988), supported by Westland (2010). The requirements were set as follows; probability level of 0.05, statistical power level of 0.80, 1 latent variable and 9 manifest variables, with an anticipated effect size of 0.30, the recommended minimum sample size to detect an effect is 87. The respondents were sampled using stratified random sampling, where the cross-sectional survey was conducted through face-to-face interviews on subjects aged 18 years and above. Only adults who had resided in their respective neighbourhoods for at least 3 years were included in the study. Self-reported socio-demographic information including gender, age, race, highest education level and housing address were collected. In the end, the study successfully engaged with 256 willing respondents from both neighbourhood categories to participate in the survey – far exceeding the sample size needed.

Measures

Outcome variable: Physical Activity for Leisure Purposes (PAL)

Participants' PAL was assessed using the Global Physical Activity Questionnaire (GPAQ) developed by the WHO. Respondents reported the frequency (days per week) and duration (minutes per day) of physical activities performed across the GPAQ domains. Following WHO guidelines, activity intensity was converted into Metabolic Equivalent of Task (MET) values, with vigorous-, moderate-, and sedentary-intensity activities assigned 8, 4, and 1 MET, respectively. Weekly PAL was calculated by multiplying the assigned MET value by the reported frequency and duration of each activity, with the total expressed as MET-minutes per week. Based on WHO recommendations, participants were classified as sedentary (<600 MET-min/week), moderately active (600–3,000 MET-min/week), or vigorously active (>3,000 MET-min/week).

Predictor variable: Perceived Neighbourhood Built Environment (PNBE)

Perceived neighbourhood-built environment (PNBE) was measured using a modified version of the Neighborhood Environment Walkability Scale–Abbreviated (NEWS-A), originally developed by Saelens et al. (2002) and subsequently refined by Cerin et al. (2006). The instrument was adapted to reflect the Malaysian urban context while maintaining the original conceptual domains. Four neighbourhood attributes were evaluated: residential density, walking and cycling facilities, surrounding aesthetics, as well as safety from traffic and crime. Perceived residential density was assessed using six items measuring respondents' perceptions of the concentration of different housing types within their neighbourhood. Following the NEWS-A scoring protocol, housing categories were assigned weighted values according to their density, with higher-density housing receiving larger weights. A composite residential density score was obtained by multiplying the perceived prevalence of each housing type by its corresponding weight and summing the resulting values.

Walking and cycling facilities were assessed through four items examining the availability, condition, accessibility, and connectivity of sidewalks and bicycle or pedestrian paths. Neighbourhood aesthetics was measured using five items assessing street greenery, shade, cleanliness, and the visual attractiveness of both natural and built features. Finally, perceived safety from traffic and crime was assessed using six items addressing traffic conditions, vehicle speed, air pollution, street lighting, natural surveillance, and opportunities for social interaction while walking. All items were rated on a 4-point Likert scale of 1: Strongly agree, 2: Agree, 3: Disagree to 4: Strongly disagree, with higher scores indicating more favourable neighbourhood environmental perceptions. The scale was set to a 4-point scale to avoid collecting a 'neutral' answer. For the questions that are positively phrased, their reported answers were coded as is. On

the other hand, for the negatively phrased questions such as “there is so much traffic along the street I live on that it makes it difficult or unpleasant to walk in my neighbourhood”, the answer of “strongly agree” indicates a less favourable walkability. As such, for such questions, the answers were reverse-coded items by flipping their numerical values before further analysis.

Moderator variable: Neighbourhood Socioeconomic Status (NSES)

Neighbourhood socioeconomic status (NSES) was determined using secondary property transaction data obtained from a local real estate database linked to the Valuation and Property Services Department Malaysia. Respondents' self-reported residential addresses were matched to the database using the street name, neighbourhood, and housing type to identify the median property value of their neighbourhood. As of July 2026, the median residential property value in Johor Bahru was RM434 per square foot. Neighbourhoods with property values above this threshold were classified as higher NSES, whereas those below the threshold were classified as lower NSES.

Statistical Analysis

For this cross-sectional study, Statistical Package for the Social Sciences (SPSS) version 22.0 and IBM SPSS AMOS version 23.0 were employed for data analysis, whereby the descriptive and latent variable's reliability analyses were conducted using the former, while Structural Equation Modelling (SEM) was conducted with the latter. Before further analysis, the latent variables involved were checked and passed reliability test where all items had a factor loading of not less than 0.5 and Cronbach's Alpha values of not less than 0.7. All data assumptions on the SEM requirements were checked and met. Physical activity for leisure purposes, residential density, race and education level were presented as single-measured items, therefore, only the remaining variables, i.e. surrounding aesthetics, walking and cycling facilities, as well as safety from crime and traffic; were put through the Pooled Confirmatory Factor Analysis. The fitness of the measurement model was established ($\chi^2= 356.54$, $df= 298$, $\chi^2/df= 1.252$, CFI= 0.970, TLI= 0.956, RMSEA= 0.016).

Convergent validity, discriminant validity, and composite reliability were subsequently established. Hence, data was imputed and the rest of the single-measured items, confounding variables and outcome variable were included to form an unconstrained structural model to be tested for NSES multi-group moderation analysis. Afterwards, the model fit for the unconstrained structural model was established ($\chi^2= 857.400$, $df= 546$, $\chi^2/df= 1.986$, CFI= 0.859, TLI= 0.890, RMSEA= 0.038). Next is to fully constrain the structural model so that the paths are forced to be equal in order to extract its chi-square value so as to compare the chi-square values of the unconstrained structural model and the

constrained structural model. Multi-group moderation was tested with the establishment of the following hypothesis;

H₀: The relationship between perceived neighbourhood-built environment (PNBE) and physical activity level (PAL) does not differ across neighbourhood socioeconomic status (NSES); and

H₁: The relationship between perceived neighbourhood-built environment (PNBE) and physical activity level (PAL) differs across neighbourhood socioeconomic status (NSES).

As such, with the significance set at $p = .05$, a significant chi-square value indicates the rejection of the null hypothesis and vice versa. In the event of significant difference between areas of lower and higher NSES, individual path under the PNBE construct will be tested by constraining one path at a time.

RESULTS

Demographic characteristics, physical activity for leisure purposes (PAL) and neighbourhood socioeconomic status (NSES)

The sample consisted of 256 participants where the majority came from lower-NSES neighbourhoods (69%). Table 1 shows that the respondents were predominantly middle-aged, male, Malay, and had attained tertiary education. Also, PAL were generally low, with 77% of participants classified as sedentary. As shown in Table 2, sedentary behaviour was prevalent across both NSES groups, where the mean PAL was 464 ± 944 MET-min/week. An interesting finding is that, although a higher proportion of sedentary individuals was observed in higher-NSES neighbourhoods, the proportion of vigorously active persons was approximately twice that of those residing in lower-NSES neighbourhoods.

Table 1: The respondents' socio-demographic characteristics (n= 256)

	Overall
Age	39.4 ± 14.4
Gender, % <i>men</i>	59
Race, %	
Malay	50
Chinese	32
Indian	16
Others	2
Education, %	
Primary	19
Secondary	31
Tertiary	50
Leisure Time Physical Activity, %	464 METs/ week (SD= ±944)
Vigorous level	4
Moderate level	19
Sedentary	77

Table 2: Proportion of respondents' leisure time physical activity (PAL) by neighbourhood socioeconomic status (NSES) (n= 256)

Neighbourhood Socioeconomic Status (NSES)	Leisure Time Physical Activity Level (PAL)		
	Vigorous level	Moderate level	Sedentary
Lower %	3	23	74
Higher %	6	9	85

Perceived neighbourhood-built environment (PNBE), physical activity for leisure purposes (PAL) and neighbourhood socioeconomic status (NSES)

Figures 1 and 2 present the structural models for participants residing in higher- and lower-NSES neighbourhoods respectively. In the higher-NSES group, perceived walking and cycling facilities ($\beta = .31$) and perceived surrounding aesthetics ($\beta = .37$) were the only neighbourhood-built environment attributes significantly associated with PAL, with surrounding aesthetics exhibiting the strongest positive association. In contrast, among respondents from lower-NSES neighbourhoods, perceived residential density ($\beta = -.15$) and perceived safety from traffic and crime ($\beta = .29$) were the only significant neighbourhood predictors of PAL. Specifically, perceived residential density demonstrated a negative association with PAL, whereas perceived safety from traffic and crime was positively associated with PAL. Race and education level were significantly associated with PAL only in the lower-NSES group. Overall, the findings indicate that the environmental attributes associated with PAL differ between higher- and lower-NSES neighbourhoods.

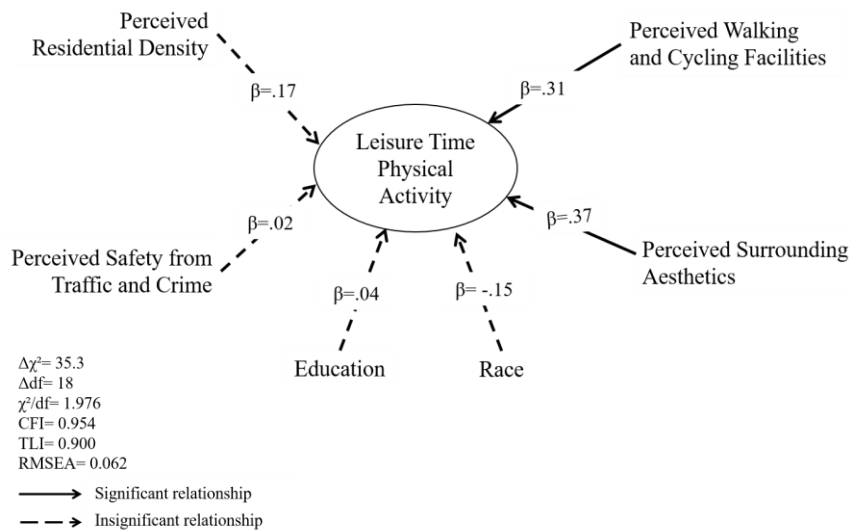


Figure 1: Perceived neighbourhood-built environment and physical activity for leisure purposes model for higher NSES

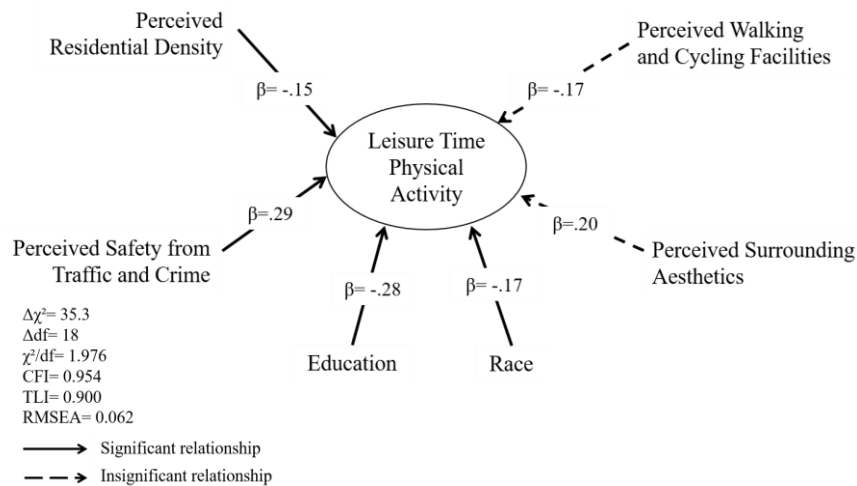


Figure 2: Perceived neighbourhood-built environment and physical activity for leisure purposes model for lower NSES

DISCUSSION

The present study demonstrates that the neighbourhood characteristics associated with PAL differ according to NSES. Specifically, perceptions of walking and cycling facilities and surrounding aesthetics were significant predictors of PAL among residents of higher-NSES neighbourhoods, whereas perceived safety from traffic and crime and residential density were significant predictors among residents of lower-NSES neighbourhoods. Furthermore, multi-group analysis revealed that only the relationship between perceived residential density and leisure-time physical activity was moderated by NSES, suggesting that the influence of residential density is dependent on the socioeconomic context in which it is experienced. These findings support ecological models of health behaviour, which propose that physical activity is shaped by the interaction between environmental and social contexts rather than by the physical environment alone (Sallis, Owen and Fisher, 2015). More importantly, they indicate that neighbourhood planning interventions may not produce uniform health outcomes across different socioeconomic settings.

The significant role of walking and cycling facilities and surrounding aesthetics in higher-NSES neighbourhoods suggests that environmental quality becomes increasingly important once fundamental neighbourhood conditions have been met. Residents living in more affluent neighbourhoods are likely to have greater access to recreational opportunities and may therefore be more responsive to neighbourhood attributes that improve the quality of the walking experience, such as attractive streetscapes and connected walking and cycling networks. These findings are consistent with previous studies reporting that neighbourhood aesthetics and walkability are positively associated with PAL, particularly in socioeconomically advantaged communities where residents have greater flexibility to engage in recreational activities. Consequently, investments aimed at improving the quality of neighbourhood environments may provide greater health benefits within higher-NSES communities.

In contrast, perceived safety from traffic and crime are strong environmental predictors of PAL in lower-NSES neighbourhoods, while perceived residential density demonstrated a negative association. These findings suggest that residents are unlikely to engage in outdoor recreational activities if they perceive their neighbourhood to be unsafe, regardless of the availability of pedestrian infrastructure or recreational facilities. Similarly, higher residential density may discourage PAL when accompanied by overcrowding, poor maintenance, or limited recreational opportunities. Therefore, the health benefits commonly associated with compact urban development should not be assumed to occur automatically. Instead, residential density should be considered alongside the quality of neighbourhood infrastructure and the overall living environment.

The moderating effect of NSES on residential density provides an important contribution to neighbourhood planning literature. Although compact development has frequently been promoted as a strategy for encouraging active living, the present findings indicate that the effectiveness of residential density depends on the socioeconomic conditions of the surrounding neighbourhood. In Malaysia, higher-density developments located within higher-NSES neighbourhoods are often characterised by better-maintained communal facilities, private recreational amenities, landscaped public spaces, and stronger neighbourhood management. Conversely, higher-density developments within lower-NSES neighbourhoods may experience challenges relating to limited recreational facilities, inadequate maintenance, traffic conflicts, and perceptions of insecurity. Consequently, residential density should not be viewed as an isolated planning objective but rather as one component of a broader neighbourhood system that includes accessibility, environmental quality, safety, and community management. This finding reinforces the need for planners to adopt a more context-sensitive approach when implementing compact city policies.

The findings also provide several practical implications for urban planning and health-oriented planning in Malaysia. First, neighbourhood planning strategies should move beyond a one-size-fits-all approach by recognising that different neighbourhood characteristics influence physical activity across socioeconomic contexts. In higher-NSES neighbourhoods, planning efforts should prioritise enhancing walking and cycling infrastructure, improving streetscape aesthetics, increasing urban greenery, and creating attractive public spaces that encourage recreational walking and active lifestyles. These interventions complement Malaysia's aspirations to develop liveable, low-carbon, and people-oriented cities under the National Physical Plan (NPP-4) and National Urbanisation Policy.

Conversely, planning priorities within lower-NSES neighbourhoods should focus on creating safe and supportive environments before promoting higher residential densities. Local authorities should strengthen traffic-calming measures, improve street lighting, enhance natural surveillance through Crime Prevention Through Environmental Design (CPTED), and ensure regular maintenance of neighbourhood parks and recreational facilities. At the same time, affordable higher-density housing developments should be accompanied by accessible open spaces, connected pedestrian networks, and community recreational facilities to ensure that compact development translates into healthier lifestyles rather than simply increasing residential concentration. Such interventions are particularly relevant given the increasing prevalence of physical inactivity, overweight, and obesity reported in the National Health and Morbidity

Survey (NHMS) 2023, which highlights the need to integrate health considerations into urban planning practice.

Overall, the present findings demonstrate that neighbourhood socioeconomic context influences how residents respond to the built environment. Integrating both physical and social environmental considerations into neighbourhood planning can contribute to more equitable and effective health promotion strategies. Future research should validate these findings using longitudinal designs and objective measures of both neighbourhood environments and physical activity to better understand the causal pathways linking neighbourhood design, socioeconomic context, and active living.

CONCLUSION

As a conclusion, this study demonstrates that NSES influences the relationship between PNBE and PAL among Malaysian adults. While walking and cycling facilities and surrounding aesthetics were more influential in higher-NSES neighbourhoods, perceived safety and residential density played a greater role in lower-NSES neighbourhoods, with NSES significantly moderating only the association between residential density and physical activity. These findings highlight the importance of adopting context-sensitive neighbourhood planning strategies rather than a one-size-fits-all approach. Integrating both built and social environmental considerations into urban planning may contribute to healthier, more active, and equitable communities in Malaysia.

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