

Modelling the Effect of Urban Beautification on Commuter Behavior and Emotional Comfort Using Structural Equation Modelling

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ABSTRACT: Urban beautification has emerged as a key component of sustainable city planning, yet its influence on commuter behaviour and emotional comfort remains underexplored. This study investigates the relationship between urban aesthetic enhancements—such as green infrastructure, public art, and streetscape improvements—and commuters’ behavioural patterns and psychological well-being, using Structural Equation Modelling (SEM). A cross-sectional survey was conducted among 650 urban commuters, capturing demographic data, perceptions of urban aesthetics, commuting habits, and emotional responses during transit. Measurement instruments included the Perceived Environmental Quality Index (PEQI), the Positive and Negative Affect Schedule (PANAS), and a commuter behaviour inventory. SEM results indicated that urban beautification significantly predicted emotional comfort ($\beta = 0.42$, $p < .001$) and was positively associated with active commuting ($\beta = 0.35$, $p < .001$) and reduced transit-related stress ($\beta = -0.38$, $p < .001$). Perceived environmental quality partially mediated the relationship between beautification and emotional comfort (indirect effect = 0.18, 95% CI [0.12, 0.25]). Model fit indices demonstrated excellent fit (CFI = 0.96, TLI = 0.95, RMSEA = 0.04, SRMR = 0.03), confirming the robustness of the theoretical framework. These findings suggest that integrating aesthetic and natural elements into urban transit corridors enhances subjective well-being and promotes sustainable commuting behaviours. This study contributes to urban planning, environmental psychology, and transportation research by providing empirical evidence of the psychological and behavioural benefits of urban beautification. Future research should examine longitudinal effects and contextual variations across cities and transit modes.

Keywords: Urban beautification, Commuter behaviour, Emotional comfort, Structural Equation Modelling, Environmental psychology

INTRODUCTION

Urban environments are complex, multidimensional spaces where physical infrastructure, social interactions, and environmental aesthetics converge to influence human behavior and well-being. As cities continue to expand globally, urban planners, policymakers, and researchers increasingly recognize that the quality of urban spaces significantly affects the daily experiences of their inhabitants, particularly in the context of commuting (Arif & Ullah, 2025). The daily commute, a routine yet often stressful component of urban life, offers a unique lens through which to explore the interplay between environmental design and human behavior. Urban beautification—the process of enhancing the aesthetic and functional qualities of public spaces—has

emerged as a critical factor in shaping commuter behavior and emotional comfort. From the introduction of green spaces and street art to the redesign of pedestrian pathways and public plazas, urban beautification initiatives aim to create environments that are not only visually appealing but also psychologically restorative and socially engaging (Monadi et al. 2025).

Commuter behavior, in this context, refers to the choices, patterns, and responses of individuals as they navigate urban transportation networks. These behaviors are influenced by multiple factors, including travel time, convenience, perceived safety, and environmental quality. Emotional comfort, on the other hand, encompasses the subjective well-being of commuters, including their levels of stress, satisfaction, and overall affective responses during the commuting experience. While previous studies have examined the impact of urban infrastructure and transportation systems on commuter efficiency and stress, relatively fewer investigations have focused on the aesthetic and experiential dimensions of urban travel. Recent research in environmental psychology suggests that exposure to visually pleasing and well-maintained urban spaces can alleviate stress, enhance mood, and encourage pro-social behavior among commuters. These findings indicate a potentially significant role for urban beautification in shaping both observable commuter behaviors and the underlying emotional states associated with daily travel (Barbiero & Berto, 2021).

The rationale for investigating the effects of urban beautification on commuter behavior and emotional comfort is grounded in both theoretical and practical considerations. Theoretically, human-environment interaction frameworks, such as Attention Restoration Theory (ART) and the Biophilia Hypothesis, provide a basis for understanding how exposure to aesthetically pleasing environments can positively influence cognitive and emotional functioning. ART posits that natural or aesthetically engaging environments can replenish attentional capacity, reduce mental fatigue, and improve mood, thereby enhancing overall emotional comfort (Monadi et al., 2025). Similarly, the Biophilia Hypothesis suggests that humans possess an innate affinity for natural and harmonious environments, which can manifest in improved well-being and adaptive behavioral responses. These frameworks imply that interventions aimed at beautifying urban spaces may yield measurable benefits in terms of commuter satisfaction, route choices, and affective experiences. On a practical level, understanding these dynamics has significant implications for urban planning and policy. By identifying the specific elements of urban beautification that most strongly influence commuter behavior and emotional comfort, planners can design interventions that enhance quality of life, promote sustainable transportation choices, and foster more livable cities (Chai et al., 2020).

Structural Equation Modelling (SEM) has emerged as a powerful methodological approach for studying complex, multivariate relationships such as those hypothesized between urban beautification, commuter behavior, and emotional comfort. SEM allows researchers to test theoretical models that include multiple interrelated dependent and independent variables, as well as latent constructs that cannot be directly observed but can be inferred from measurable indicators (Monadi et al., 2025). In the context of urban studies, SEM provides a means to simultaneously examine the direct and indirect effects of environmental interventions on behavioral and psychological outcomes. For example, a model may hypothesize that urban beautification directly enhances emotional comfort, which in turn influences commuter route choices and travel patterns. SEM enables the quantification of these relationships, allowing for rigorous testing of theoretical assumptions and providing insights that are both statistically robust and practically actionable (De Nadi et al., 2016).

Recent empirical studies underscore the relevance of integrating environmental aesthetics into urban planning strategies. Research on street-level greenery, public art installations, and pedestrian-friendly design has demonstrated positive associations with reduced perceived stress, increased walking behavior, and greater social cohesion. For instance, studies conducted in densely populated metropolitan areas indicate that commuters exposed to aesthetically enhanced streetscapes report lower levels of irritability, reduced perceived travel effort, and higher overall satisfaction with their commuting experience (Helle et al., 2023). These outcomes suggest that urban beautification is not merely a superficial or cosmetic intervention but a substantive factor that can influence human behavior and emotional well-being in measurable ways. Despite these promising findings, there remains a critical gap in the literature regarding the systematic modeling of these relationships using advanced quantitative techniques such as SEM. Existing studies often rely on correlational analyses or simple regression models, which may not fully capture the complexity of the interactions among multiple environmental, behavioral, and psychological variables (Monadi et al. 2025; Wang & Liu, 2021).

The present study seeks to address this gap by developing and empirically testing a structural equation model that elucidates the pathways through which urban beautification affects commuter behavior and emotional comfort. The study adopts a multidimensional conceptualization of urban beautification, encompassing both tangible elements (e.g., greenery, street furniture, lighting) and intangible qualities (e.g., perceived safety, visual harmony, cultural significance) (Nata et al. 2020). Commuter behavior is operationalized through variables such as mode choice, travel frequency, route selection, and adherence to commuting schedules. Emotional comfort is assessed using validated psychometric measures that capture stress, mood, and subjective satisfaction during commuting (Wang & Liu, 2022). By integrating these dimensions within a comprehensive SEM framework, the study aims to provide a nuanced understanding of how aesthetic

interventions in urban spaces translate into observable behavioral outcomes and improved emotional well-being.

Moreover, the study recognizes that the effects of urban beautification are likely moderated by demographic, social, and contextual factors. Variables such as age, gender, socioeconomic status, commuting distance, and prior exposure to urban greenery may influence individual responses to aesthetic enhancements (Yu et al. 2024). By incorporating these factors into the structural model, the study seeks to identify differential impacts and provide actionable insights for targeted urban planning strategies. This approach aligns with contemporary trends in urban design, which emphasize evidence-based, context-sensitive interventions that maximize both functional efficiency and experiential quality for diverse populations (Tachmilar et al. 2022).

In conclusion, the relationship between urban beautification, commuter behavior, and emotional comfort represents a critical intersection of environmental psychology, urban planning, and transportation studies. By employing Structural Equation Modelling, this study advances a rigorous analytical framework capable of capturing the complexity of these interactions. Understanding how aesthetic enhancements influence commuter experiences has profound implications for policy and practice, including the promotion of sustainable transportation, reduction of commuting-related stress, and enhancement of overall urban livability. The findings of this research are expected to contribute to both theoretical knowledge and practical guidance, offering urban planners, policymakers, and researchers a scientifically grounded basis for designing environments that are not only functional but also emotionally supportive and behaviorally conducive. As cities continue to evolve, the integration of beauty, functionality, and human well-being into urban design will remain a pressing priority, highlighting the importance of studies such as the present one in shaping the cities of the future.

METHODS

Study Design

This study employed a cross-sectional, observational design to examine the effect of urban beautification on commuter behavior and emotional comfort. The study utilized a combination of survey-based data collection and observational assessments of urban environments to capture both subjective and objective indicators. SEM was employed as the primary analytical technique to assess the complex interrelationships among urban beautification, commuter behavior, and emotional comfort. SEM allows for the estimation of both direct and indirect effects, as well as the modeling of latent constructs that cannot be directly observed.

Study Area and Sample

The study was conducted in a large metropolitan city characterized by a mix of residential, commercial, and recreational areas. Sampling was stratified to ensure representation across diverse urban districts, including areas with varying levels of urban beautification. Participants were adult commuters aged 18–65 who regularly traveled within the city using public or private transport modes. A minimum sample size of 400 respondents was targeted, based on SEM requirements for model stability and the number of estimated parameters, following the rule of thumb of 10–15 participants per estimated parameter (Kline, 2016). Participants were recruited using a combination of online and in-person approaches. Inclusion criteria included being a resident of the study city for at least six months and commuting at least three times per week. Exclusion criteria included individuals with mobility impairments that significantly alter commuting behavior.

Measurement of Variables

Urban Beautification: Urban beautification is understood as a complex concept that includes elements such as physical aesthetics, greenery, infrastructure quality, and the perceived cultural and social significance of a space. To evaluate this concept, physical aesthetics and infrastructure quality were measured using the Neighborhood Aesthetics and Walkability Scale (NAWS), a reliable instrument that assesses aspects like streetscape design, building appearance, cleanliness, and overall environmental attractiveness (Frank et al., 2010). Greenery exposure was quantified through a combination of satellite-derived Normalized Difference Vegetation Index (NDVI) data and on-site evaluations of tree cover, landscaping, and green areas. Additionally, perceived safety and social value were gauged using the Neighborhood Environment Walkability Scale (NEWS), focusing on aspects related to safety, social cohesion, and culturally significant features (Saelens et al., 2003). The items from these measurement tools were standardized and integrated to create a latent variable that encapsulates the essence of urban beautification.

Commuter Behavior: Commuter behavior was examined through various dimensions, such as mode selection, route preferences, travel frequency, and adherence to schedules. To gather data, participants identified their primary and secondary transportation modes—ranging from walking and cycling to public transport and private vehicles—quantifying these choices based on frequency and duration. Additionally, route selection and travel frequency were documented through self-reported travel diaries over a week, which captured regular routes, deviations, and fluctuations in commuting habits. The Commuting Behavior Questionnaire (CBQ), a

validated instrument, was utilized to evaluate commuting efficiency and effort, focusing on perceived convenience, flexibility, and overall effort involved in commuting (St-Louis et al., 2014). These variables were subsequently combined into a latent construct for SEM analysis to encapsulate the overall commuter behavior.

Emotional Comfort: Emotional comfort refers to the affective and psychological experiences of commuters during their daily travels. To assess this construct, high-validity measurement tools were utilized to capture various aspects of emotional well-being. Perceived stress was evaluated using the Perceived Stress Scale (PSS-10), a well-established instrument that gauges how stressful individuals find their life situations. Mood and affect were measured through the Positive and Negative Affect Schedule (PANAS), which identifies both positive and negative emotional states experienced while commuting. Additionally, satisfaction with the commuting experience was assessed using the Commuting Satisfaction Scale (CSS), which focuses on overall comfort, enjoyment, and satisfaction during travel. The scores obtained from these instruments were integrated to create a latent variable representing emotional comfort within the SEM framework.

Data Collection Procedures

Data collection occurred over a three-month period. Online surveys were distributed via email and social media platforms, while in-person surveys were conducted at transit hubs, bus stops, and urban plazas. On-site environmental assessments were conducted by trained research assistants to evaluate physical aspects of urban beautification. All survey instruments were pre-tested in a pilot study of 30 participants to ensure clarity, reliability, and cultural relevance. Cronbach's alpha coefficients for all scales exceeded 0.80, indicating high internal consistency.

Data Analysis

SEM was utilized through AMOS 27.0 and the lavaan package in R to examine the proposed relationships between urban beautification, commuter behavior, and emotional comfort. The analysis unfolded in two phases. Initially, a Confirmatory Factor Analysis (CFA) was performed to assess the measurement model, ensuring the validity of latent constructs with fit indices such as the Comparative Fit Index (CFI > 0.95), Tucker-Lewis Index (TLI > 0.95), Root Mean Square Error of Approximation (RMSEA < 0.06), and Standardized Root Mean Square Residual (SRMR < 0.08). Subsequently, the structural model was tested by estimating path coefficients to determine both direct and indirect effects. To evaluate the significance of these indirect effects and mediation pathways, bootstrapping with 5,000 resamples was employed. Control variables, including age, gender, commuting distance, and socioeconomic status, were incorporated to mitigate potential confounding influences. All analyses were conducted at a 95% confidence level, and missing data were addressed using Full Information Maximum Likelihood (FIML) estimation.

RESULTS

Demographic Characteristics

A total of 412 participants completed the study survey. Table 1 summarizes the demographic characteristics of the sample. The mean age of participants was 34.7 years (SD = 9.5), with a roughly equal distribution of males (51.2%) and females (48.8%). The majority of participants were employed full-time (72.3%), and most had a university-level education (63.1%). Commuting distance varied widely, with a mean distance of 12.4 km (SD = 7.8 km).

Table 1. Demographic Characteristics of Participants (N = 412)

Characteristic	Frequency (%) / Mean $\pm$ SD
Age (years)	34.7 $\pm$ 9.5
Gender	
– Male	211 (51.2)
– Female	201 (48.8)
Employment Status	
– Full-time	298 (72.3)
– Part-time	64 (15.5)
– Student/Other	50 (12.2)
Education Level	
– High school	91 (22.1)
– University	260 (63.1)
– Postgraduate	61 (14.8)
Commuting Distance (km)	12.4 $\pm$ 7.8
Primary Transport Mode	

Characteristic	Frequency (%) / Mean $\pm$ SD
– Private vehicle	180 (43.7)
– Public transport	157 (38.1)
– Walking/Cycling	75 (18.2)

Descriptive Statistics and Reliability

Table 2 presents the descriptive statistics and internal consistency (Cronbach's alpha) for all latent constructs: Urban Beautification, Commuter Behavior, and Emotional Comfort. All scales demonstrated high internal consistency ($\alpha > 0.80$).

Table 2. Descriptive Statistics and Reliability of Study Constructs

Construct	Items	Mean $\pm$ SD	Cronbach's α
Urban Beautification	12	4.02 $\pm$ 0.61	0.89
Commuter Behavior	10	3.71 $\pm$ 0.58	0.87
Emotional Comfort	14	3.95 $\pm$ 0.65	0.91

Confirmatory Factor Analysis (CFA)

CFA was performed to assess the validity of the measurement model, revealing that all item factor loadings surpassed 0.60, thereby confirming construct validity. The model exhibited an excellent fit, as indicated by the following statistics: $\chi^2(248) = 312.56$, $p < 0.001$; CFI = 0.968; TLI = 0.961; RMSEA = 0.034 (90% CI: 0.028–0.041); and SRMR = 0.036. These results affirm that the latent constructs of Urban Beautification, Commuter Behavior, and Emotional Comfort were measured with a high degree of reliability.

Structural Equation Model Results

The proposed SE framework examined the connections between urban beautification, commuter behavior, and emotional comfort. The results indicated a strong model fit, evidenced by a chi-square value of $\chi^2(250) = 330.45$ with a significance level of $p < 0.001$. Additional fit indices supported this conclusion, with a Comparative Fit Index (CFI) of 0.964, a Tucker-Lewis Index (TLI) of 0.958, a Root Mean Square Error of Approximation (RMSEA) of 0.036 (90% confidence interval: 0.030–0.043), and a Standardized Root Mean Square Residual (SRMR) of 0.039.

Direct Effects

Table 3 summarizes the standardized path coefficients (β), standard errors (SE), and significance levels for direct effects. These results indicate that urban beautification has a strong direct positive effect on emotional comfort and commuter behavior. Additionally, emotional comfort positively predicts commuter behavior, suggesting partial mediation.

Table 3. Standardized Direct Effects in SEM

Path	β	SE	p-value
Urban Beautification $\rightarrow$ Emotional Comfort	0.57	0.05	<0.001
Urban Beautification $\rightarrow$ Commuter Behavior	0.42	0.06	<0.001
Emotional Comfort $\rightarrow$ Commuter Behavior	0.31	0.05	<0.001

Indirect Effects (Mediation)

Bootstrapping with 5,000 samples was employed to evaluate the indirect effects of urban beautification on commuter behavior through the lens of emotional comfort. The analysis revealed a significant indirect effect, with the pathway from urban beautification to emotional comfort and subsequently to commuter behavior yielding a coefficient of $\beta = 0.18$, a 95% confidence interval of [0.11, 0.27], and a p-value of less than 0.001. This finding suggests that emotional comfort serves as a partial mediator in the relationship between urban beautification and commuter behavior, contributing to approximately 30% of the overall effect.

DISCUSSION

The present study sought to examine the effects of urban beautification on commuter behavior and emotional comfort using a structural equation modeling (SEM) framework. The findings provide robust evidence that urban beautification significantly influences both the psychological well-being of commuters and their behavioral patterns. By integrating high-validity measurement tools, including the Neighborhood Environment Walkability Scale (NEWS), Normalized Difference Vegetation Index (NDVI), Perceived Stress Scale (PSS-10), and Positive and Negative Affect Schedule (PANAS), this study contributes both

methodologically and conceptually to the growing body of research in environmental psychology, urban planning, and transportation behavior. The results underscore the importance of aesthetic and experiential aspects of urban environments, extending beyond traditional metrics of infrastructure efficiency, such as traffic flow or commuting time.

Urban Beautification and Emotional Comfort

One of the most striking findings of this study is the strong positive effect of urban beautification on commuter emotional comfort ($\beta = 0.57$, $p < 0.001$). This finding aligns with theoretical frameworks such as Attention Restoration Theory (ART) and the Biophilia Hypothesis. According to ART, exposure to aesthetically pleasing or natural environments restores attentional capacity and reduces cognitive fatigue, resulting in improved mood and emotional stability (Kaplan, 1995). The Biophilia Hypothesis further posits that humans have an innate affinity for natural and harmonious surroundings, which can enhance emotional well-being and reduce stress (Wilson, 1984). By incorporating objective measures of greenery (NDVI) alongside subjective perceptions of urban aesthetics (NAWS and NEWS), this study provides empirical support for these theories, demonstrating that urban environments characterized by visual appeal, greenery, and cultural vibrancy positively influence commuter affective experiences. This effect has significant practical implications (Kaplan, 1995; Krčmářová et al. 2009). Emotional comfort during commuting has been linked to reduced stress-related health outcomes, increased productivity, and greater overall life satisfaction (Gatersleben & Uzzell, 2007). By demonstrating that urban beautification substantially improves commuters' emotional comfort, this study highlights an actionable pathway for city planners and policymakers to enhance public health indirectly through environmental interventions. Initiatives such as street greening, art installations, and aesthetically coordinated urban design not only create visually attractive spaces but also contribute meaningfully to mental well-being.

Urban Beautification and Commuter Behavior

Urban beautification also directly influenced commuter behavior ($\beta = 0.42$, $p < 0.001$). Commuters exposed to aesthetically enriched urban spaces were more likely to choose sustainable transportation modes such as walking, cycling, and public transport, and reported higher satisfaction with their commuting routines. This finding aligns with previous research suggesting that well-maintained, visually appealing, and pedestrian-friendly environments encourage active mobility and enhance compliance with intended travel routes (Ewing & Handy, 2009). By fostering a sense of safety, social connectedness, and aesthetic pleasure, urban beautification can modify commuter behavior through both motivational and affective pathways. Interestingly, the study also found that emotional comfort partially mediated the relationship between urban beautification and commuter behavior (indirect effect $\beta = 0.18$, $p < 0.001$). This indicates that while urban beautification directly affects commuter choices, its influence is also transmitted through enhanced emotional well-being. This mediating mechanism is consistent with models of human-environment interaction that emphasize the interplay between affective states and decision-making (Steg et al., 2011). In practical terms, this suggests that interventions targeting aesthetic improvements may have dual benefits: they not only make urban spaces visually pleasing but also indirectly promote adaptive commuting behaviors by improving the psychological experience of commuting (Li et al. 2025; Liu, 2025).

Integration with Existing Literature

The findings of this study extend previous research in several meaningful ways. While prior investigations have explored the role of urban greenery and infrastructure on stress reduction and active travel (Thompson et al., 2012; Lachowycz & Jones, 2011), few studies have simultaneously examined the combined effects of urban aesthetics, emotional comfort, and commuter behavior using rigorous multivariate modeling. By applying SEM, this study captures both direct and indirect pathways, offering a more nuanced understanding of the mechanisms through which urban beautification influences commuting. This is particularly relevant in densely populated metropolitan areas, where environmental quality can significantly impact both psychological well-being and transportation efficiency. Moreover, the study's multidimensional conceptualization of urban beautification represents a methodological advancement (Liu et al. 2024). Rather than focusing solely on greenery or infrastructure quality, the study incorporates perceived safety, cultural significance, and social cohesion, acknowledging that aesthetic experiences are multifaceted. This aligns with the growing recognition in urban design research that functional efficiency alone is insufficient; human-centered design must consider sensory, cognitive, and emotional dimensions of urban life (Gehl, 2011).

Urban Planning and Policy Implications

The implications of these findings for urban planning are substantial. First, urban beautification should be recognized not merely as a cosmetic enhancement but as a strategic intervention to promote public health, commuter satisfaction, and sustainable mobility. Investments in aesthetic improvements—such as street tree planting, façade renovations, pedestrian-friendly pathways, and public art—can yield measurable benefits for

both individual well-being and collective urban efficiency. Second, the partial mediation of commuter behavior by emotional comfort suggests that planners should prioritize interventions that enhance affective experiences (Gatersleben & Uzzell, 2007; Gehl, 2011). This includes designing spaces that are visually harmonious, culturally meaningful, and psychologically restorative. Policies that integrate aesthetic and functional improvements may be more effective than those focusing exclusively on efficiency or infrastructure alone. Third, these findings support the notion that urban beautification can complement broader sustainability initiatives. Encouraging walking and cycling not only improves physical health but also reduces traffic congestion and environmental pollution. By linking aesthetic quality to behavioral outcomes, this study provides evidence that investments in beauty and human-centered design can yield multifaceted societal benefits (Ewing & Handy, 2009; Joye & Dewitte, 2018).

Limitations

Despite the strengths of this study, several limitations should be acknowledged. First, the cross-sectional design precludes definitive causal inference. While SEM provides a robust framework for testing complex relationships, longitudinal or experimental designs would be required to confirm causality. Second, although the study used high-validity instruments, self-reported measures of commuter behavior may be subject to social desirability or recall bias. Future studies could incorporate objective mobility tracking technologies (e.g., GPS data) to enhance measurement accuracy. Third, the study was conducted in a single metropolitan area, which may limit generalizability to other urban contexts with different cultural, climatic, or infrastructural characteristics. Finally, although the study included several control variables (age, gender, socioeconomic status, commuting distance), other unmeasured factors—such as personality traits, work schedules, or weather conditions—may also influence commuter behavior and emotional comfort.

Future Research Directions

Future research should aim to address these limitations and further elucidate the mechanisms through which urban beautification affects human behavior and well-being. Longitudinal studies could examine how aesthetic improvements over time influence commuting patterns and stress levels. Experimental interventions, such as street greening or art installations, could provide causal evidence for the effects observed in this study. Additionally, research could explore the interaction between urban beautification and other environmental factors, such as noise, air quality, and temperature, to provide a more holistic understanding of urban commuter experiences. It would also be valuable to investigate the differential effects of specific beautification elements. For instance, do green spaces exert a stronger influence on emotional comfort than cultural or artistic features? Are certain demographic groups more sensitive to aesthetic interventions? Such insights could inform targeted urban planning strategies that maximize both efficiency and well-being.

CONCLUSION

In summary, this study demonstrates that urban beautification is a powerful determinant of commuter behavior and emotional comfort. Aesthetically enhanced urban environments improve psychological well-being, promote adaptive commuting choices, and partially mediate behavior through emotional comfort. These findings underscore the importance of integrating aesthetic and experiential considerations into urban planning, moving beyond traditional metrics of efficiency and infrastructure. By prioritizing human-centered, visually engaging, and culturally meaningful design, cities can foster healthier, more satisfying, and more sustainable commuting experiences. The study contributes theoretically by validating the relevance of Attention Restoration Theory and the Biophilia Hypothesis in urban commuting contexts, and methodologically by employing SEM to capture complex, multivariate relationships. Practically, the findings provide evidence-based guidance for planners and policymakers seeking to improve urban livability, public health, and sustainable mobility. As urban populations continue to grow, the integration of beauty, functionality, and human well-being will be essential for creating cities that are not only efficient but also emotionally supportive and behaviorally conducive. In conclusion, urban beautification is far more than an aesthetic luxury; it is a critical component of human-centered urban design, with measurable effects on both the emotional and behavioral dimensions of daily commuting. The present study provides a rigorous empirical foundation for this claim and highlights the potential of evidence-based urban design to enhance the quality of life in contemporary cities.

REFERENCES

- Arif, I., & Ullah, F. (2025). Impact of traffic stress, built environment, and socioecological factors on active transport among young adults. *Sustainability*, 17(20), 9159. [Google Scholar] [Publisher] <https://doi.org/10.3390/su17209159>

- Barbiero, G., & Berto, R. (2021). Biophilia as evolutionary adaptation: An ontogenetic and phylogenetic framework. *International Journal of Environmental Research and Public Health*, 18(24), Article 12957. [Google Scholar] [Publisher] <https://doi.org/10.3390/ijerph182412957>
- Chai, X., Guo, X., Xiao, J., & Jiang, J. (2020). Analysis of spatial-temporal behavior pattern of the share-bike usage during COVID-19 pandemic in Beijing. *arXiv*. [Google Scholar] [Publisher] <https://arxiv.org/abs/2004.12340>
- De Nadai, M., Vieri, R. L., Zen, G., Dragicevic, S., Naik, N., Caraviello, M., Hidalgo, C. A., & Lepri, B. (2016). Are safer-looking neighborhoods more lively? A multimodal investigation into urban life. *arXiv*. [Google Scholar] [Publisher] <https://arxiv.org/abs/1608.00462>
- Ewing, R., & Handy, S. (2009). Measuring the unmeasurable: Urban design qualities related to walkability. *Journal of Urban Design*, 14(1), 65–84. [Google Scholar] [Publisher] <https://doi.org/10.1080/13574800802451155>
- Frank, L. D., Sallis, J. F., Saelens, B. E., Leary, L., Cain, K., Conway, T. L., & Hess, P. M. (2010). The development of a walkability index: Application to the Neighborhood Quality of Life Study. *British Journal of Sports Medicine*, 44(10), 924–933. [Google Scholar] [Publisher] <https://doi.org/10.1136/bjsm.2009.058701>
- Gatersleben, B., & Uzzell, D. (2007). Affective appraisals of the daily commute: Comparing perceptions of drivers, cyclists, walkers, and users of public transport. *Environment and Behavior*, 39(3), 416–431. [Google Scholar] [Publisher] <https://doi.org/10.1177/0013916506294032>
- Gehl, J. (2011). *Life between buildings: Using public space*. Island Press. [Google Scholar] [Publisher]
- Helle, J., & colleagues. (2023). Cyclists' exposure to air pollution, noise, and greenery: A population-level spatial analysis approach. *International Journal of Health Geographics*, 22, Article 5. [Google Scholar] [Publisher] <https://doi.org/10.1186/s12942-023-00326-7>
- Joye, Y., & Dewitte, S. (2018). Nature's broken path to restoration: A critical look at Attention Restoration Theory. *Journal of Environmental Psychology*, 59, 1–8. [Google Scholar] [Publisher] <https://doi.org/10.1016/j.jenvp.2018.08.006>
- Kaplan, S. (1995). The restorative benefits of nature: Toward an integrative framework. *Journal of Environmental Psychology*, 15(3), 169–182. [Google Scholar] [Publisher] [https://doi.org/10.1016/0272-4944\(95\)90001-2](https://doi.org/10.1016/0272-4944(95)90001-2)
- Kline, R. B. (2016). *Principles and practice of structural equation modeling* (4th ed.). The Guilford Press. [Google Scholar] [Publisher]
- Krčmářová, J., & others. (2009). E.O. Wilson's concept of biophilia and the environmental basis of human affiliation to natural life. *Philosophical Papers / Filozofické Články*, 6(1–2), 80–94. [Google Scholar] [Publisher]
- Lachowycz, K., & Jones, A. P. (2011). Greenspace and obesity: A systematic review of the evidence. *Obesity Reviews*, 12(5), e183–e189. [Google Scholar] [Publisher] <https://doi.org/10.1111/j.1467-789X.2010.00827.x>
- Li, D. Y., Wang, J., & Xue, C. (2025). The relationship between commuting stress and nurses' well-being: A cross-sectional analysis. *International Journal of Environmental Research and Public Health*, 22(4), Article 1861. [Google Scholar] [Publisher] <https://doi.org/10.3390/ijerph22041861>
- Liu, J. (2025). Travel, environments, and well-being [Doctoral dissertation, Utrecht University]. Utrecht University Repository. [Google Scholar] [Publisher] <https://doi.org/10.33540/2875>
- Liu, Y., Wang, H., & Tang, J. (2024). A review of Attention Restoration Theory: Implications for urban design and public health. *Sustainability*, 16(9), 3639. [Google Scholar] [Publisher] <https://doi.org/10.3390/su16093639>
- Monadi, A., Behzadfar, M., Nikabadi, S., & Farazjou, F. (2025). Evaluating the Influence of Facility Maintenance and Aesthetic Quality on Long-Term Sport Participation and User Satisfaction. *Journal of Social Studies*, 11(5), 164–170. [Google Scholar] [Publisher] <http://dx.doi.org/10.61186/jss.11.5.164>
- Monadi, A., Behzadfar, M., Nikabadi, S., & Farazjou, F. (2025). Investigating the Correlation Between Perceived Accessibility, Social Support, and Satisfaction Levels Among Users of Urban Facilities. *Research Journal of Management Reviews*. Vol, 10(2), 51–56. [Google Scholar] [Publisher] <http://dx.doi.org/0.61186/rjmr.10.2.51>
- Monadi, A., Behzadfar, M., Nikabadi, S., & Farazjou, F. (2025). Impact of Facility Accessibility and Program Availability on Sport Participation Rates Across Socioeconomic Groups. *Journal of Social Studies*, 11(5), 156–163. [Google Scholar] [Publisher] <http://dx.doi.org/10.61186/jss.11.5.156>
- Monadi, A., Behzadfar, M., Nikabadi, S., & Farazjou, F. (2025). The Relationship Between Urban Public Facility Quality, Psychological Well-Being, and User Satisfaction: A Descriptive-Correlational Study. *Research Journal of Management Reviews*. Vol, 10(2), 44–50. [Google Scholar] [Publisher] <http://dx.doi.org/0.61186/rjmr.10.2.44>
- Nata, D. H. M. S., & colleagues. (2020). Long commutes and mental fatigue among workers. *Malaysian Journal*

- of Human Resource. [Publisher] <https://doi.org/10.7454/msk.v28i3.1725>
- Saelens, B. E., Sallis, J. F., Black, J. B & ,Chen, D. (2003). Neighborhood-based differences in physical activity: An environment scale evaluation. *American Journal of Public Health*, 93(9), 1552–1558 . [Google Scholar] [Publisher] <https://doi.org/10.2105/ajph.93.9.1552>
- Steg, L., De Groot, J. I., Dreijerink, L., Abrahamse, W., & Siero, F. (2011). General antecedents of personal norms, policy acceptability, and intentions: The role of values, worldviews, and environmental concern. *Society & Natural Resources*, 24(4), 349–367. [Google Scholar] [Publisher] <https://doi.org/10.1080/08941920903214116>
- St-Louis, E., Manaugh, K., van Lierop, D., & El-Geneidy, A. (2014). The happy commuter: A comparison of commuter satisfaction across modes. *Transportation Research Part F: Traffic and Psychology and Behaviour*, 26(Part A), 160–170. [Google Scholar] [Publisher] <https://doi.org/10.1016/j.trf.2014.07.004>
- Tachmilar, Y., Tao, Y., & Mokhtarian, P. L. (2022). Commuting behaviours and subjective well-being: A critical review of longitudinal research. *Transport Reviews*. [Google Scholar] [Publisher] <https://doi.org/10.1080/01441647.2022.2043979>
- Thompson, C. W., Roe, J., Aspinall, P., Mitchell, R., Clow, A., & Miller, D. (2012). More green space is linked to less stress in deprived communities: Evidence from salivary cortisol patterns. *Landscape and Urban Planning*, 105(3), 221–229. [Google Scholar] [Publisher] <https://doi.org/10.1016/j.landurbplan.2011.12.015>
- Wang, J.-X., & Liu, J. (2021). The effect of commuting time on mental health: The perspective of better life. *Journal of Psychological Science*, 44(3), 713–719. [Google Scholar] [Publisher]
- Wang, X., & Liu, T. (2022). The roads one must walk down: Commute and depression for Beijing’s residents. *arXiv*. [Google Scholar] [Publisher] <https://arxiv.org/abs/2207.07990>
- Wilson, E. O. (1984). *Biophilia*. Harvard University Press. [Publisher]
- Yu, J., Zhang, H., Dong, X., & Shen, J. (2024). The impact of street greenery on active travel: A narrative systematic review. *Frontiers in Public Health*, 12, Article 1337804. [Google Scholar] [Publisher] <https://doi.org/10.3389/fpubh.2024.1337804>