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Ecological and Perceptual Factors Shaping Age-Friendly Quality in Rural Public Spaces

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Abstract
As rural aging intensifies in China, public spaces are increasingly important for older adults’ well-being and social interaction. This study examines how ecological quality shapes age-friendly outcomes through perceptual evaluation and health-related appraisal. Using Dongquan Village as a case, the research combines behavioural observation, 176 valid questionnaires, and PLS-SEM. Results show that better ecological conditions improve perceptual evaluation and health-related appraisal, which together enhance overall satisfaction. Observations further indicate that shaded semi-open spaces and continuous greenery encourage longer stays and everyday interaction. The findings support ecology-oriented improvement of rural public spaces in aging communities.

Keywords: Age-friendly rural public space; Ecological experience; Spatial perception; PLS-SEM

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1.0 Introduction

As the population ages in rural China, public spaces have become increasingly relevant to older adults’ everyday activities, participation in local life, and emotional well-being. (Organization, 2007). As younger residents continue to move out and life expectancy rises, many rural communities are aging faster than urban ones. Under this demographic shift, public spaces are no longer used mainly for movement and circulation, but have become everyday settings for leisure, interaction, and psychological adjustment (Gehl, 2011). Existing research has mainly focused on accessibility, barrier-free provision (R. Wang et al., 2024), and service-related improvement, whereas relatively limited attention has been paid to place-based ecological qualities such as greenery continuity, tree shade, and microclimatic comfort, as well as to their indirect influence on participation and satisfaction through perceptual processes (Bowler et al., 2010; Lin et al., 2010; Wang & Misni, 2026). Although recent studies have linked environmental quality, green-space conditions, and community landscape settings to older adults’ quality of life, physical activity, and social participation, most of this evidence comes from urban or broad community contexts. The ecological and perceptual pathways that shape age-friendliness in rural public spaces therefore remain underexplored (Wang & Misni, 2026; Xu et al., 2023; Zhang et al., 2023). From an environmental-behaviour perspective, physical settings do not influence behaviour directly alone; their effects are filtered through perceptual and cognitive evaluation. In this process, spatial perception connects environmental attributes with behavioural response, while perceived health benefit contributes to the overall judgement of place quality (Gifford, 2014; Mehrabian & Russell, 1974).

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This study proposes a structural path model of "Ecological Experience – Spatial Perception – Perceived Health Effect – Overall Satisfaction" to assess how ecological optimisation enhances age-friendliness through perceptual and health-cognition pathways. Using Dongquan Village in Jinan as a case study, we applied Partial Least Squares Structural Equation Modelling (PLS-SEM) to test the proposed relationships, complemented by behavioural observation for contextual validation, based on 176 valid questionnaires. This research empirically identifies the multi-path mechanisms through which ecological experiences influence the quality of age-friendliness, clarifies the mediating roles of spatial perception and perceived health effects, and establishes a dual-layer framework of "model testing – behaviour validation" to enhance contextual interpretability.

This study makes three contributions. First, it shifts the focus of age-friendly rural public space research from facility provision alone to the ecological–perceptual mechanisms underlying satisfaction. Second, it tests a multi-path mediation framework that clarifies the roles of spatial perception and perceived health effect in translating ecological experience into age-friendly outcomes. Third, it combines structural modelling with behavioural evidence to improve the contextual interpretability of rural environmental research.

2.0 Literature Review

2.1 Research Progress on Age-Friendly Rural Public Spaces

With the advancement of the active ageing agenda, developing age-friendly environments has become a central concern in planning and landscape design (Organization, 2007). Existing research primarily focuses on material and functional improvements—such as barrier-free facilities, pedestrian safety, and service provision—emphasising accessibility and diversity in urban settings (Gehl, 2011; Xu et al., 2022). In contrast, rural public spaces play a vital role in everyday life, facilitating production, social interaction, and neighbourhood attachment within familiar networks (Wang et al., 2015). While the social importance of these spaces is recognised, studies often concentrate on infrastructure, with limited attention paid to how ecological environmental quality influences participation and satisfaction through perceptual mechanisms. Therefore, there is a need to shift the focus toward examining ecological quality and spatial perception processes in age-friendly rural public spaces. In recent years, research has increasingly highlighted the relationship between public space quality and the well-being of older adults, emphasising the importance of environmental comfort, accessibility, and social interaction. However, empirical studies specifically addressing rural public spaces remain limited, especially regarding how ecological experiences translate into behavioural and perceptual outcomes (R. Wang et al., 2024; Zhang et al., 2023).

2.2 Ecological Environmental Quality and Elderly Behaviour

Ecological environmental quality plays a significant role in influencing outdoor comfort and the attractiveness of public spaces (Bowler et al., 2010). Factors such as green coverage, tree canopy shading, and microclimatic regulation affect the activity frequency and duration of older adults' stays in these environments (Lin et al., 2010). Restorative environment theory suggests that natural elements contribute to satisfaction and stress reduction through mechanisms like "being away," "fascination," and "compatibility." Furthermore, the continuity of greenery and semi-open spaces enhances perceived safety and encourages social engagement (Kaplan & Kaplan, 1989; Sugiyama et al., 2008). Despite these insights, current research primarily focuses on correlational studies and does not systematically examine the structural relationships among ecological experiences, spatial perceptions, and behavioural outcomes. More recent studies have begun to investigate the impact of green infrastructure, microclimatic comfort, and landscape quality on the physical and psychological health of older adults (X. Wang et al., 2024; Xu et al., 2022). However, these studies often fail to integrate ecological variables into a comprehensive structural framework. In rural settings, where ecological features are part of everyday life, there is a need for structural path analysis to better understand how ecological experiences influence the use of public spaces through perceptual and health cognition processes (Yu et al., 2024).

2.3 Environmental–Behaviour Perspective and Mediating Mechanisms

Environmental–behaviour theory suggests that environmental factors influence attitudes and behaviours through perceptual and cognitive processes (Mehrabian & Russell, 1974; Wang & Misni, 2026). Key aspects of spatial perception—such as safety, accessibility, and comfort—serve as important mediators between environmental stimuli and the use of public spaces (Gifford, 2014). Additionally, perceived health effects, which reflect subjective assessments of physical and psychological benefits, play a crucial role in shaping satisfaction and participation (Hartig et al., 2014; R. Wang et al., 2024). Although the "environment–perception–behaviour" framework is well established, studies on rural public spaces rarely utilise structural equation modelling to test these mechanisms (Hair et al., 2019; Yu et al., 2024). Thus, applying structural modelling is necessary to clarify how ecological experiences indirectly influence satisfaction through perceptual and health-related cognitive processes.

3.0 Methodology

3.1 Study Area

Dongquan Village, located in the mountainous area of Jinan, was selected as the case study due to its representative hilly landscape and well-defined node–path spatial structure. The structure includes a central square, waterfront nodes, a main street, and transitional residential spaces. As rural ageing increases, these areas serve as essential venues for older adults' social and leisure activities. The village features distinct ecological characteristics—such as spring-fed waterfronts, tree-lined streets, shaded facilities, and continuous greenery—combined with a mix of traditional and renovated social spaces. This setting provides a suitable context for examining the pathway through which ecological quality shapes perceptual evaluation, health-related appraisal, and overall satisfaction. Behavioural observations enhance the explanatory validity of this examination.

(a) (b)

Fig. 1: Dongquan Village in the mountainous area of Jinan, China: (a) distribution of village spatial resources; (b) aerial view of the village.

3.2 Theoretical Framework and Research Hypotheses

This study, guided by environmental-behaviour theory, develops a structural path model linking Ecological Experience (ECO), Spatial Perception (SPA), Perceived Health Effect (PHE), and Spatial Satisfaction (SPS). (Figure 2) to examine how Ecological Experience systematically affects age-friendly outcomes. The study proposes the following direct hypotheses: H1 (ECO → SPA), H2 (ECO → PHE), H3 (SPA → PHE), H4 (PHE → SPS), H5 (ECO → SPS), and H6 (SPA → SPS). In addition, mediating mechanisms are tested through H7 (SPA mediates the relationship between ECO and PHE), H8 (PHE mediates the relationship between ECO and SPS), and H9 (ECO indirectly influences SPS through the chain pathway SPA → PHE)（Fig 2）. Taken together, these hypotheses form a multi-path explanatory framework for analysing how ecological conditions shape age-friendly quality in rural public spaces.

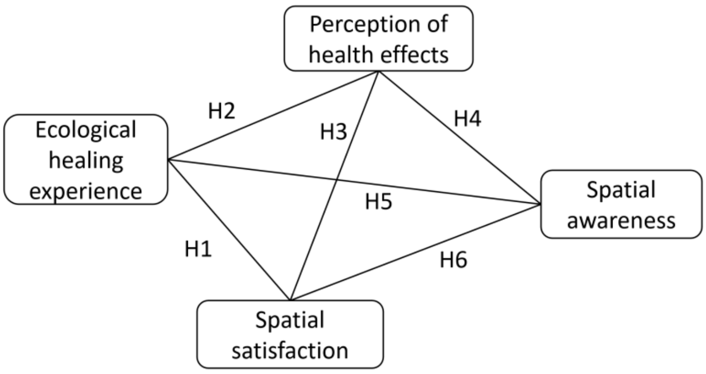

Fig. 2: Theoretical framework diagram.

3.3 Questionnaire Design and Data Analysis

Measurement items were developed for four constructs—Ecological Experience (ECO), Spatial Perception (SPA), Perceived Health Effect (PHE), and Spatial Satisfaction (SPS)—using a five-point Likert scale. A total of 176 valid responses from residents aged 60 and above were obtained, with all constructs showing strong reliability (Cronbach's $\alpha > 0.80$). Data were analysed using PLS-SEM, assessing measurement validity through factor loadings, composite reliability (CR), and average variance extracted (AVE), and evaluating structural relationships via path coefficients and R^2 values. Path significance and mediation effects were tested using 5,000 bootstrap resamples in SmartPLS.

3.4 Behavioural Observation for Contextual Validation

Systematic behavioural observations and mapping were conducted during peak daily periods to record older adults' activity types, durations, and spatial distribution, and to link activity hotspots to ecological features. This approach strengthened contextual support for associations between environmental conditions and behaviour, but did not establish causality.

4.0 Results

4.1 Measurement Model Assessment

The measurement model was first examined in terms of construct reliability and validity. As shown in Table 1, all standardised loadings exceeded 0.70, ranging from 0.712 to 0.816, indicating that the observed indicators adequately reflected the corresponding latent dimensions. Cronbach's α values fell between 0.819 and 0.880, rho_A ranged from 0.824 to 0.882, and CR values ranged from 0.874 to 0.907, all of which satisfied the recommended thresholds (Hair et al., 2019; Hair Jr et al., 2021). These results indicate acceptable internal consistency and good measurement stability.

Table 1: Model fitting results.

Constructs	Items	Factor Loading	Cronbach's α	rho A	CR	AVE
Ecological Experience（ECO）	ECO1	0.730	0.834	0.838	0.878	0.546
	ECO2	0.758				
	ECO3	0.714				
	ECO4	0.728				
	ECO5	0.775				
	ECO6	0.729				
Spatial Awareness (SPA)	SPA1	0.789	0.880	0.882	0.907	0.581
	SPA2	0.804				
	SPA3	0.770				
	SPA4	0.712				
	SPA5	0.778				
	SPA6	0.759				
Perception of health effects (PHE)	PHE1	0.763	0.862	0.865	0.897	0.592
	PHE2	0.781				
	PHE3	0.719				
	PHE4	0.769				
	PHE5	0.717				
	PHE6	0.794				
	PHE7	0.789				
Spatial satisfaction (SPS)	SPS1	0.720	0.819	0.824	0.874	0.581
	SPS2	0.762				
	SPS3	0.743				
	SPS4	0.766				
	SPS5	0.816				

For convergent and discriminant validity, the AVE values for ECO (0.546), SPA (0.581), PHE (0.592), and SPS (0.581) were all above 0.50, indicating adequate convergent validity (Fornell & Larcker, 1981). In addition, each construct's AVE square root exceeded its correlations with the other constructs, supporting discriminant validity (Fornell & Larcker, 1981; Henseler et al., 2015). Overall, the measurement model was considered suitable for subsequent structural analysis.

4.2 Structural Model Analysis

4.2.1 Overall Model Fit

The overall fit of the structural model is reported in Fig 3 and Table 2. The SRMR value was 0.073 for both the saturated and estimated models, which is below the commonly accepted threshold of 0.08 (Henseler et al., 2014), indicating acceptable model fit. The remaining fit statistics, including d_ULS = 1.596, d_G = 0.676, and NFI = 0.747, were also within acceptable ranges.

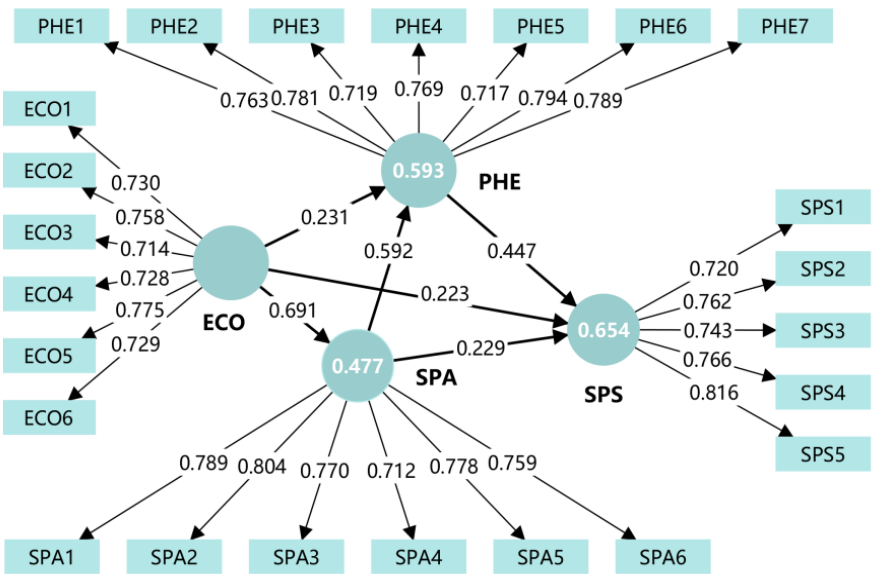

Fig. 3: Model of PLS-SEM path analysis diagram.

The model showed moderate to substantial explanatory power, with R^2 values of 0.477 for Spatial Perception (SPA), 0.593 for Perceived Health Effect (PHE), and 0.654 for Spatial Satisfaction (SPS), indicating particularly strong predictive power for overall satisfaction (Chin, 1998; Hair et al., 2019). Collinearity assessment revealed VIF values ranging from 1.000 to 2.774, all below the threshold of 5, indicating no significant multicollinearity and confirming the stability of the structural relationships (Hair et al., 2019). Overall, the model demonstrates adequate fit and explanatory strength, supporting further analysis of path coefficients and mediating effects.

Table 2: Collinearity analysis and model fit.

Dimension Correlation	VIF	SRMR
ECO -> PHE	1.914	Saturated model = 0.073 Estimated model = 0.073 d_ULS=1.596 d_G=0.676 NFI=0.747
ECO -> SPA	1.000	
ECO -> SPS	2.045	
PHE -> SPS	2.454	
SPA -> PHE	1.914	
SPA -> SPS	2.774	

4.2.2 Path Coefficient Testing

The direct paths reported in Table 3 were examined using a bootstrapping procedure with 5,000 resamples. All six hypothesised paths were significant at $p < 0.001$, providing support for H1–H6 (Hair et al., 2019). Ecological Experience showed a strong positive association with Spatial Perception (β = 0.691, t = 19.322) and also had a significant direct effect on Perceived Health Effect (β = 0.231, t = 17.289). Spatial Perception, in turn, exerted a substantial effect on Perceived Health Effect (β = 0.592, t = 10.430), indicating that perceptual evaluation is an important mechanism between environmental conditions and health-related appraisal. Perceived Health Effect had a significant positive effect on Spatial Satisfaction (β = 0.447, t = 4.716). At the same time, both Ecological Experience (β = 0.223, t = 3.555) and Spatial Perception (β = 0.229, t = 2.673) retained direct positive effects on satisfaction. These findings suggest that perceived health appraisal occupies a central position in the pathway from ecological experience to satisfaction.

Table 3. Assume the result of the path verification.

Hypothesis	Relationship	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	p Values	Decision
H1	ECO -> SPA	0.691	0.695	0.040	19.322***	0.000	Supported
H2	ECO -> PHE	0.231	0.231	0.072	17.289***	0.000	Supported
H3	SPA -> PHE	0.592	0.594	0.057	10.430***	0.000	Supported
H4	PHE -> SPS	0.447	0.449	0.095	4.716***	0.000	Supported
H5	ECO -> SPS	0.223	0.223	0.063	3.555***	0.000	Supported
H6	SPA -> SPS	0.229	0.229	0.086	2.673***	0.000	Supported

*(Source:) *** Statistical significance was achieved at p < 0.001.*

4.3 Mediation Analysis

To examine the mediating mechanisms, indirect effects were tested using bootstrap analysis (Table 4). Results indicate that H7–H9 were all statistically significant ($p < 0.001$) (Hair et al., 2019; Preacher & Hayes, 2008). Ecological Experience indirectly influenced Perceived Health Effect through Spatial Perception (β = 0.409, t = 9.121), suggesting that ecological conditions first enhance health cognition by improving spatial perception. Ecological Experience also indirectly affected Spatial Satisfaction through Perceived Health Effect (β = 0.103, t = 2.485). Moreover, a significant chain mediation effect was identified, whereby Ecological Experience influenced Spatial Satisfaction through the sequential pathway of Spatial Perception → Perceived Health Effect (β = 0.183, t = 4.181), indicating the presence of multiple mediating mechanisms.

Overall, Ecological Experience influences Spatial Satisfaction both directly and indirectly through the sequential pathway of Spatial Perception and Perceived Health Effect, forming a partial mediation structure. These findings further support the environmental–behaviour theoretical framework, confirming the mechanism through which physical environments shape behavioural and attitudinal outcomes via perceptual evaluation processes.

Table 4. Assume the result of the mediating path verification.

Hypothesis	Relationship	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	p Values	Decision
H7	ECO -> SPA->PHE	0.409	0.412	0.045	9.121***	0.000	Supported
H8	ECO -> PHE -> SPS	0.103	0.104	0.041	2.485***	0.000	Supported
H9	ECO -> SPA->PHE -> SPS	0.183	0.185	0.044	4.181***	0.000	Supported

*(Source:) *** Statistical significance was achieved at p < 0.001.*

4.4 Behavioural Validation

Behavioural mapping was used to validate the structural model findings. Results show that shaded semi-open areas with dense tree canopy had longer stays and higher levels of social and sedentary activities. Continuous green corridors and waterfront spaces formed clear activity clusters, supporting the positive link between ecological Experience and spatial perception. Areas with greater environmental comfort also demonstrated stronger behavioural persistence and interaction. Overall, the spatial patterns reinforce the model, confirming that ecological improvements enhance older adults' public space use by strengthening spatial perception and health-related experiences.

5 0 Discussion

The results indicate that ecological quality makes an important contribution to perceptual evaluation, which is consistent with the environmental stimulus–evaluation logic of environmental-behaviour theory. (Gifford, 2014; Mehrabian & Russell, 1974). Ecological attributes such as greenery continuity, canopy shade, and microclimatic comfort appear to improve older adults' perceptions of safety and comfort in rural public spaces. This pattern reflects a close linkage between ecological condition and perceptual response and is consistent with previous discussions of age-friendly environmental quality (Kaplan & Kaplan, 1989; Sugiyama et al., 2008; Wang & Misni, 2026; Zhang et al., 2023). The results also suggest that spatial perception plays a stronger role in perceived health effects than the direct contribution of ecological experience alone. In this sense, ecological qualities may influence health-related appraisal largely through perceptual interpretation.

Fig. 4: Representative ecological spatial conditions in Dongquan Village:(a) tree canopy shading in the central square;(b) semi-open communication node;(c) Shade area under the tree; (d) waterfront microclimatic space;(e) residential transitional space;(f) activity clustering under a shaded environment.

At the level of overall evaluation, perceived health benefit emerged as one of the key determinants of satisfaction. This indicates that older adults assess public spaces based on physical comfort and psychological well-being as well as functionality and visual appeal (Bowler et al., 2010; Hartig et al., 2014; R. Wang et al., 2024). Therefore, optimising rural public spaces should shift from a facility-oriented approach to a health-oriented strategy. In practical terms, design interventions should focus on providing shaded resting areas, continuous greenery, safe semi-open gathering spaces, and environmentally friendly waterfront areas. These features can enhance perceived safety, encourage longer stays, and foster low-intensity social interactions among older adults (Yu et al., 2024). This shift would enhance spatial perception and health cognition through ecological improvements, aligning with the age-friendly framework (Organization, 2007). Behavioural observations support these structural pathways, demonstrating activity clustering in shaded, semi-open areas, thereby reinforcing the model's contextual validity (Fig 4).

Rural public spaces are more closely linked to daily life and community networks compared to urban environments. In these settings, ecological elements are intricately connected to both production and living activities (R. Wang et al., 2024). This strong integration leads to a more direct and lasting impact of ecological experiences on spatial perception and health awareness, which aligns with existing research on rural landscapes (Wilson, 2008). The study validates a multi-path model demonstrating that ecological experiences influence satisfaction through spatial perception and perceived health effects. This highlights the combined role of ecological improvement and perceptual mechanisms, expanding environmental-behaviour theory to rural contexts and advancing research on age-friendly rural public spaces (Wang & Misni, 2026). While based on a single-village case, the findings suggest a broader design logic for ageing rural communities, in which ecological comfort, perceived safety, and health-related evaluations collectively influence satisfaction with public spaces.

6.0 Conclusion

This study tested a structural model linking ecological quality, perceptual evaluation, health-related appraisal, and overall satisfaction to explain age-friendly quality in rural public spaces. The findings show that ecological quality, especially greenery continuity and shading, improves older adults' judgement of space by reinforcing perceived safety and comfort. Spatial perception further transmits these effects to perceived health benefit and overall satisfaction, while perceived health effect emerged as the strongest direct predictor of satisfaction. Ecological experience also affected satisfaction through both direct and chained indirect pathways. Behavioural observation supported these findings by showing that older adults' activities were more likely to cluster in shaded and semi-open places. The study therefore suggests that ecological quality influences age-friendly outcomes not only directly but also through perceptual and health-related appraisal processes. In practice, improving rural public spaces for aging communities should prioritize continuous greenery, shaded resting areas, semi-open communication settings, and waterfront zones with favourable microclimatic conditions.

Several limitations should be noted. First, the study is based on a single rural case, which restricts the wider transferability of the findings. Second, the analysis primarily relies on cross-sectional self-reported data and lacks sufficient objective environmental indicators or longitudinal evidence. Third, seasonal variation and subgroup differences among older adults were not examined in sufficient detail. Future research may therefore extend this work through multisite comparison, the inclusion of objective environmental and microclimatic measures, and more detailed analysis across seasons, gender, and age groups.

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References

Bowler, D. E., Buyung-Ali, L. M., Knight, T. M., & Pullin, A. S. (2010). A systematic review of evidence for the added benefits to health of exposure to natural environments. *BMC Public Health*, *10*(1), 456.

Chin, W. W. (1998). The partial least squares approach to structural equation modeling. In *Modern methods for business research* (pp. 295–336). Psychology Press.

Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research*, *18*(1), 39–50.

Gehl, J. (2011). Life between buildings.

Gifford, R. (2014). Environmental psychology matters. *Annual Review of Psychology*, *65*, 541–579.

Hair, J. F., Risher, J. J., Sarstedt, M., & Ringle, C. M. (2019). When to use and how to report the results of PLS-SEM. *European business review*, *31*(1), 2–24.

Hair Jr, J. F., Hult, G. T. M., Ringle, C. M., Sarstedt, M., Danks, N. P., & Ray, S. (2021). *Partial least squares structural equation modeling (PLS-SEM) using R: A workbook*. Springer Nature.

Hartig, T., Mitchell, R., De Vries, S., & Frumkin, H. (2014). Nature and health. *Annual review of public health*, *35*(1), 207–228.

Henseler, J., Dijkstra, T. K., Sarstedt, M., Ringle, C. M., Diamantopoulos, A., Straub, D. W., Ketchen Jr, D. J., Hair, J. F., Hult, G. T. M., & Calantone, R. J. (2014). Common beliefs and reality about PLS: Comments on Rönkkö and Evermann (2013). *Organizational research methods*, *17*(2), 182–209.

Henseler, J., Ringle, C. M., & Sarstedt, M. (2015). A new criterion for assessing discriminant validity in variance-based structural equation modeling. *Journal of the academy of marketing science*, *43*(1), 115–135.

Kaplan, R., & Kaplan, S. (1989). *The experience of nature: A psychological perspective*. Cambridge University Press.

Lin, T.-P., Matzarakis, A., & Hwang, R.-L. (2010). Shading effect on long-term outdoor thermal comfort. *Building and environment*, *45*(1), 213–221.

Mehrabian, A., & Russell, J. A. (1974). *An approach to environmental psychology*. the MIT Press.

Organization, W. H. (2007). *Global age-friendly cities: A guide*. World Health Organization.

Preacher, K. J., & Hayes, A. F. (2008). Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. *Behavior research methods*, *40*(3), 879–891.

Sugiyama, T., Leslie, E., Giles-Corti, B., & Owen, N. (2008). Associations of neighbourhood greenness with physical and mental health: do walking, social coherence, and local social interaction explain the relationships? *Journal of Epidemiology & Community Health*, *62*(5), e9–e9.

Wang, D., Brown, G., & Liu, Y. (2015). The physical and non-physical factors that influence perceived access to urban parks. *Landscape and Urban Planning*, *133*, 53–66.

Wang, R., Song, Y., Yang, L., & Browning, M. H. (2024). Neighbourhood green space and loneliness in middle-aged and older adults: Evidence from the WHO Study on Global Ageing and Adult Health in China. *Urban Forestry & Urban Greening*, *95*, 128324.

Wang, X., & Misni, A. (2026). Exploring the impact of ecological and cultural factors on public spaces: case study on rural public spaces landscape for an age-friendly group in Huangchao Village, Jinan, China. *Landscape and Ecological Engineering*. https://doi.org/10.1007/s11355-026-00704-w

Wang, X., Misni, A. M., Buyadi, S. N. A., & Sobbri, N. H. (2024). Analysis of particular design methods for aging landscapes in residential areas. *Built Environment Journal*, *21*, 229–244.

Wilson, G. A. (2008). From 'weak 'to ' strong ' multifunctionality: Conceptualising farm-level multifunctional transitional pathways. *Journal of rural studies*, *24*(3), 367–383.

Xu, L., Han, H., Yang, C., & Liu, Q. (2023). The influence mechanism of the community's subjectively built environment on the physical and mental health of older adults. *Sustainability*, *15*(17), 13211.

Xu, T., Nordin, N. A., & Aini, A. M. (2022). Urban green space and subjective well-being of older people: a systematic literature review. *International Journal of Environmental Research and Public Health*, *19*(21), 14227.

Yu, J., Zhang, L., & Shi, Q. (2024). Impact of green space on older adults' quality of life based on spatial and non-spatial analyses. *Land*, *13*(11), 1874.

Zhang, Y., Luo, H., Xie, J., Meng, X., & Ye, C. (2023). The influence and prediction of the built environment on the subjective well-being of the elderly based on random forest: evidence from Guangzhou, China. *Land*, *12*(10), 1940.