

Urban Neighbourhood Outdoor Environments and Age-friendliness: A Study of Jaipur City, India

Parshant Rehal¹, Prabhjot Singh Chani², Sonal Atreya³, and Harsimran Kaur⁴

¹Research Scholar, Department of Architecture and Planning,
Indian Institute of Technology Roorkee-247667, Uttarakhand, India

²Professor, Department of Architecture and Planning,
Indian Institute of Technology Roorkee-247667, Uttarakhand, India

³Associate Professor, Department of Architecture and Planning,
Indian Institute of Technology, Roorkee-247667, Uttarakhand, India

⁴Assistant Professor, Department of Architecture, Planning and Design,
Indian Institute of Technology, BHU Varanasi-247667, Uttarakhand, India

*E-Mail: sonal.atreya@ariitr.ac.in

*Corresponding Author

Abstract—An age-friendly built environment is crucial for older adults to retain an active lifestyle, impacting their ability to independently execute all their daily activities in out-of-home settings. The availability of public spaces within outdoor environments is often associated with improving social inclusiveness and additional health benefits. The aspect of an outdoor built environment for geriatric populations to enjoy good health and well-being remains under-studied in the context of Indian cities. Therefore, the study attempts to understand the key challenges experienced by older adult populations towards their daily life activities in the outdoor built environment in Indian cities. The study hypothesized that the quality of neighbourhood public and green open spaces, along with the accessibility to such outdoor spaces, strongly impact the overall satisfaction level of older adults. A mixed method approach has been adopted to conduct the study, incorporating observational analysis and surveys administered among the urban older adult populations. Survey schedules were carried out among randomly selected older adult residents aged 60 years and above (n =70) in and around the urban neighbourhoods in Jaipur city. Correlation analysis and regression analysis were conducted on the responses from the older adults. Findings indicate that accessibility barriers and safety concerns from traffic negatively impact the satisfaction and active ageing among elderly residents within the out-of-home neighbourhood environment. Creating age-friendly neighbourhood spaces and improving the accessibility linkages between the home and the outdoor built environment through architecture and design interventions can help improve user experiences and life satisfaction among the ageing population.

Keywords: Outdoor Environments, Age-friendliness, Well-being, Public Open spaces

INTRODUCTION

Population ageing has become an evident demographic future in many developed nations and is projected to be a reality for many developing nations, including India, in the forthcoming decades. As the percentage of older adults in

the global population expected to increase from 10% in 2022 to 16% by 2050, a considerable segment of this cohort is believed to be confronted with health-related challenges and disabilities for an extended period due to frailty and

diminished muscular strengths. Such demographic trends call for developing social, physical, and environmental infrastructures to support the specific needs of ageing populations and help them maintain healthy lifestyles (Steels, 2015). While various researchers establish health, age care and financial aspects as essential aspects for life satisfaction among older adults, a conducive neighbourhood and city-built environment is essential to enhance opportunities for active ageing and social connectedness among older adults.

Supporting ageing from different perspectives has received focus from the United Nations and other international bodies since 1982. World Health Organization has been propagating the idea of Age-friendly cities since 2007, which focuses on the lives of older adult populations and their living environment for enhancing health, care, social inclusion and participation (WHO, 2007). The 2030 agenda for Sustainable development focuses on developing sustainable cities and communities. With a focus on creating age-friendly environments, the United Nations has declared the decade from 2021 to 2030 as the decade of healthy ageing.

Nuclear family structures have become the contemporary realities of our societies in the wake of migration and urbanization, thus leaving behind older adult populations and enhancing stresses experienced by the individuals who cross an age of 60 years and above towards maintaining independent outdoor functional abilities to carry out most basic Activities of daily life (ADL). As people age, most develop health disorders associated with diminished cognitive and physical capabilities characterized by decreased muscular strength and disturbed gait concerns. As such, it becomes pertinent for planning bodies and policymakers to work towards creating age-friendly outdoor spaces in a neighbourhood-built environment, which becomes the first point of outdoor contact to provide a supportive living environment for the ageing population towards maintaining social connectedness and independent mobility. The research attempts to explore and investigate a few research questions: a) What outdoor activities are considered necessary by older adults in their daily routines? (b) What are the various challenges experienced by older adults towards their independent functioning and active ageing in outdoor spaces in Jaipur city?

With an emphasis on the strategic development of urban neighbourhoods and city environments, scholarly research

investigations into the person-environment fit in the context of older adults have gathered considerable attention across developed nations (Salmistu & Kotval, 2023). The advantages of creating age-friendly neighbourhoods have been extensively studied and presented in research from developed nations; research on relationships between built environment aspects and active and successful ageing has been in the infant stage in India.

IMPORTANCE OF AGE-FRIENDLY CITIES

Various scholars link outdoor environments' quality and accessibility with opportunities for enhancing inclusiveness and quality of life among older adults. As a minimum of 150 minutes per week of physical activity (PA) is recommended to maintaining healthy ageing, neighbourhoods with green open spaces in close and walkable vicinity encourage ageing individuals to enhance opportunities for physical activity. Low-quality outdoor spaces create physical barriers and aggravate psychological challenges towards carrying outdoor basic ADLs (Liu *et al.*, 2023). When living arrangements are limited as older adult couples or alone, any physical or psychological ailments exacerbate feelings of isolation and increased risk of fear of tripping or falling while performing physical activity necessitating active mobility between home and outdoor environments. As such, several outdoor public and green open spaces such as parks, playgrounds, lawns, and community, religious and retail centres become the first choice of older adults.

PUBLIC OPEN SPACE AVAILABILITY

Researchers from the social science and medicine field stress the need for the availability of public green open spaces within neighbourhoods for positive effects on self-perceived perceptions of health and well-being among the most vulnerable demographic groups, particularly older adults. Not only do these Urban green spaces (UGS) create opportunities for carrying out physical activity, but they are often considered to have positive effects on the psychological health of older adults. The correlations between opportunities for active ageing and the quality of outdoor neighbourhood spaces, as well as how such open spaces function in the contemporary times of changing urban planning priorities in the face of urbanization pressures characterized by shrinkage of available open spaces for development are few crucial aspects that may be necessary for planning bodies to comprehend (Lee *et al.*, 2015).

ACTIVE AGEING AND OUTDOOR ACCESSIBILITY AND MOBILITY

Many scholars from the Western developed nations have discussed the safety and comfort of accessibility and mobility. While outdoor safety perceptions are often linked to traffic conditions, pedestrian conditions and availability of amenities, the willingness of older adults to traverse through the outdoors is also dependent upon the aspects related to design, maintenance and absence of physical barriers to walkability (Mercader-Moyano *et al.*, 2020). Associations between physical activity levels, destination and route characteristics, along with neighbourhood characteristics have been studied by scholars in the past (Zhang *et al.*, 2024). Researchers relate varied outdoor activities requiring outdoor mobility in the category of physical activity (PA) for leisure, shopping and exercise.

TRADITIONAL NEIGHBOURHOODS AND AGEING-IN-PLACE

Most traditional neighbourhoods that attract tourists with their exceptional built environments also offer excellent outdoor places for older adult citizens, who typically have a long-standing physical and psychological association with these cities. Not only is the environment a significant aspect, but neighbourhood and city environments are also capable of fostering community connections and the inclusion of older adult populations. Perspectives of planning building contemporary neighbourhoods and city planning perspective align with the ideas of traditional city planning principles, which centre on the design of compact neighbourhoods characterized by a land use mix and well-connected vehicular and pedestrian accessibility (Meetiya-goda, 2018). Providing such a built environment becomes advantageous to older adults as it offers access to places for acquiring basic needs, activities, and commodities in a comfortable and safe walkable environment. Lifestyle variations and social connectivity needs vary a lot among the younger generations, and shifting to newer places often affects the mental health and outdoor activity patterns among older adults, leading to social isolation. Researchers have exhibited the effects of uncontrolled and unplanned development resulting in the decay of these central heritage districts in most towns. Under the stresses of overcrowding and tourism expansion, the social and spatial needs of these neighbourhoods' original and long-term inhabitants, particularly older adult residents, are compromised (Yung *et al.*, 2016). Researchers opined that planning the neighbourhood and city environments can benefit a larger populace by providing an optimal built environment that caters to the interests and needs of the entire community,

enhancing the capacities for independent functioning capabilities and alleviating the stresses on care providers.

While research on linking ageing-in-place and active ageing with person-environment fit has garnered much attention in developed nations, comparable studies are still in their infancy state in the case of developing countries like India. Therefore, the article aims to understand the physical and psychological challenges from the neighbourhood outdoor built environments towards independent and active ageing in Indian urban areas.

METHOD

The study hypothesized that the quality of neighbourhood public and green open spaces, along with the accessibility to such outdoor spaces, strongly impact the overall satisfaction level of older adults. Survey data was collected to gain insights into the perception of older adult residents in Jaipur City, India. The study was conducted in 2022 during morning and evening hours. A structured questionnaire was administered to older adult residents of Jaipur to reflect their perceptions about the suitability, quality, and availability of outdoor public and green open spaces within their neighbourhoods and surrounding areas. Two variables, public green open space quality (NPGOS) and accessibility conditions (AC), were considered independent for inclusion in the survey instrument. Likert scale was used to assess the responses of older adults. Outdoor satisfaction level (OSL) was assumed as a dependent variable. The survey items were finalized through secondary literature review, focus group discussions and experts from academic and professional backgrounds. Since a lot of older adults exhibited unwillingness to talk to strangers and go outside for the recommended time of PA to the parks and other public areas in the wake of the psychological barriers caused by the outbreak of COVID 19 pandemic in India, random sampling was conducted to gain survey responses from the 60 years and higher age groups. Furthermore, administering online questionnaires was not preferred to reach the older adult residents in Jaipur, who are uninformed about email and other online communication tools and social media, and thus the aforementioned reasons attributed to the fewer survey responses limited to 70 respondents.

Along with the descriptive analysis of the characteristics of the sample population, regression analysis was performed on the survey responses using the IBM SPSS Statistics 20 package. Data collection was conducted in an urban region under the municipal jurisdiction of Jaipur city, as the research aimed to comprehend the traditional and modern lives of older adult people.

STUDY AREA PROFILE

Jaipur City, the capital of Rajasthan state, developed in 1727, is one of the few examples of a planned city in India. Also recognized as Pink City, the contemporary metropolitan city image originated from the walled city, the main heritage area of the city, from where the city expanded outwards to its present shape. Jaipur, having a total of 467 square kilometres of area, has a population of 3.1 million

as per Census of India data. The walled city, also a major tourist destination of India, encompasses many famous and magnificent heritage structures and is enlisted as a world heritage site. Jaipur falls under the hot and semi-arid climate zone characterized by hot and long summers and mild winters and precipitation exceeding 625 mm annually. Jaipur offers several public and green open spaces at the city, local, and neighbourhood levels.

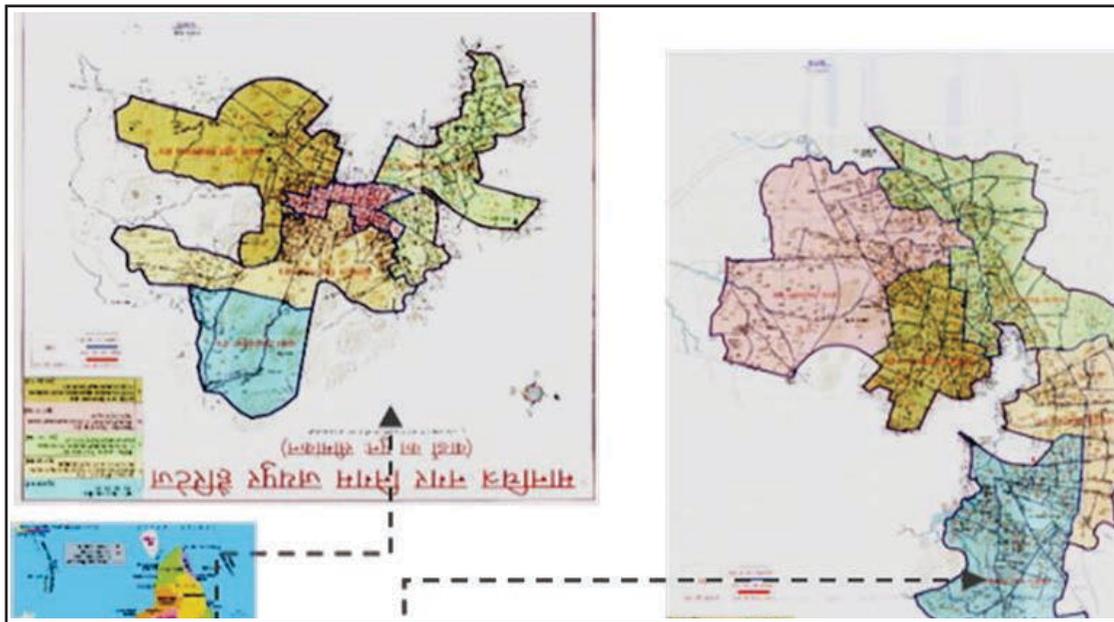


Fig. 1: Jaipur Location Plan. (Source: Jaipur Development Authority)

RESULTS

Statistical analysis was carried out on the data derived from the survey responses. Descriptive analysis helped to understand the critical characteristics of the sample population. As seen in Figure 1, out of 70 respondents aged 60 years and above who participated in the survey, 41 were male while 29 were females (Fig. 2). The Number of females was found to be generally low in most open spaces for engaging in daily outdoor activities like walking or exercise and preferred to remain engaged in their domestic daily activities. Almost 67% of older adults live in a joint family structure, while 30% of them stay as couples.

Data also exhibits that while most older adults go outdoors for daily physical activities at least once a day, there was a visible decline in levels of out-of-home engagements as age declines among older adults.

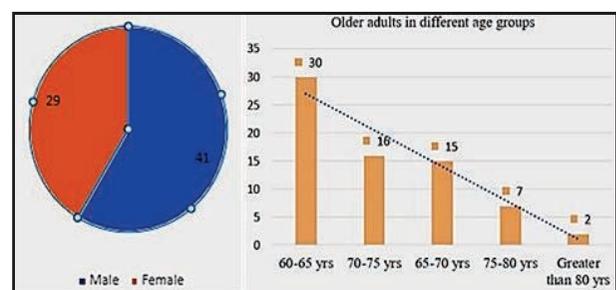


Fig. 2: Sample Population's Composition

Almost 58% of adults exhibit carrying out physical activity daily, and 21% of them showcased never or rarely carrying out any outdoor physical activities, which was either due to walking-related or other health ailments. Also, some older adults perceived the fear of falling and tripping and strenuous walking environments as psychological barriers.

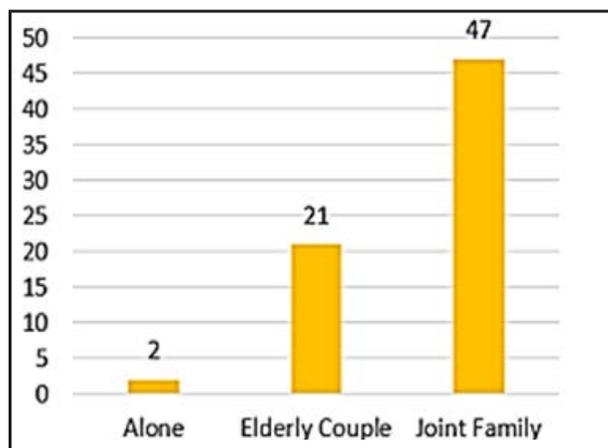


Fig. 3: Living Arrangements Among Respondents

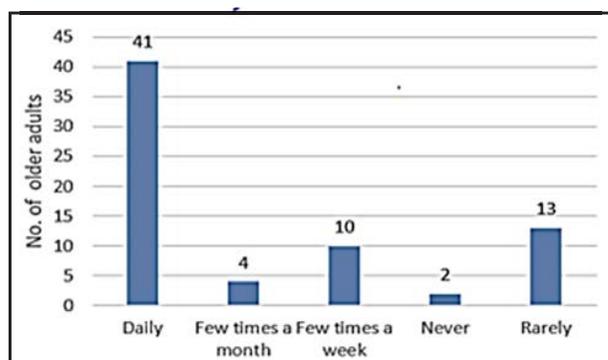


Fig. 4: Frequency of Outdoor Activity

ASSOCIATION BETWEEN NEIGHBOURHOOD PUBLIC AND GREEN OPEN SPACES

About 64% of older adults agree that public green open spaces are located in walkable proximity to their home environments. While 41.4% were unsatisfied, 38.6% of older adults feel satisfied with the maintenance and cleanliness of public and green open spaces. The percentage of older adults satisfied (54.3%) with the availability and adequacy of micro amenities like seatings, provision of litter bins and rain shelters was higher than those unsatisfied (17%) with it, while almost 40 % had neutral responses. Almost 48% of older adults showcased satisfaction with the provision of artificial lighting. A higher percentage of the population exhibited concerns about the availability of clean drinking water and toilet facilities. Almost 34% of older adults exhibited concerns about the lack of universal accessibility at easy entry and exit points to such places. Similarly, a higher percentage of older adults were satisfied with the adequate shading and safety in the public green open spaces.

ACCESSIBILITY CONDITIONS

A relatively higher number of older adults (58%) showcased dissatisfaction about their safety due to higher traffic speeds of bikers on internal streets and provisions of controlling the traffic speeds through traffic calming measures. More than 55% of older adults considered their experience of crossing roads as threatening and uncomfortable. While 44% of older adults were dissatisfied with the provision of pedestrian user traffic signals and signages, almost 26% were unaware of such measures. 44% of the respondents were satisfied with the maintenance and quality of sidewalks and pedestrian walks, while 32% exhibited discontentment. 33% of respondents did not consider the sidewalks to be obstructed by parked vehicles or vendors, while a higher percentage of the population exhibited concerns about the presence of street furniture on their usual routes for outdoor activities.

INFERENCE STATISTICS

Inferential statistical analysis was performed using the IBM SPSS 20 statistical package along with the descriptive analysis. Correlation analysis was performed between OSL, NPGOS, and TC variables. There was a higher correlation between AC and OSL at .629 and a significance level of .000. Also, the NPGOS had a positive influence on OSL at .619 at a significance level of .000. Correlation between all three variables was found to be significant at 0.01 level representing a positive strong correlation between the variables.

Table 1: Correlation Matrix

		OSL	IPGOS	AC
OSL	Pearson Correction	1	.619**	.629**
	Sig. (2-tailed)		.000	.000
	N	70	70	70
NPGOS	Pearson Correction	.619**	1	.638**
	Sig. (2-tailed)	.000	-	.000
	N	70	70	70
AC	Pearson Correction	.629**	.638**	1
	Sig. (2-tailed)	.000	.000	-
	N	70	70	70

** Correlation is significant at the 0.01 level (2-tailed).

REGRESSION ANALYSIS

Regression analysis was performed to determine the causal effects of neighbourhood public and green open spaces

(NPGOS) and accessibility conditions (AC) on overall satisfaction levels (OSL) among older adult residents. Results (Table 3-6) indicate a strong causal effect of neighbourhood public and green open spaces on the overall satisfaction levels OSL). The impact of accessibility conditions (AC) on the overall satisfaction level of older adult residents residing in Jaipur city has been identified as relatively more significant, with a t-value of 3.427 and a significance level of

.001. NPGOS, having a t-value of 3.191 and a significance level of 0.002, is also a significant impactor for OSL. ANOVA was performed on the survey responses data, which reflected the model to be significant as indicated by the F-statistics ($f=30.290, p<0.01$). While both the predictor variables have a strong influence on OSL, accessibility conditions (AC) have a relatively higher influence on the OSL.

Table 2: R square values statistics

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.689 ^a	.475	.459	.57940

Table 3: Coefficients for Regression model

Coeffucuebts

Model	Unstandardized Coefficients		Standardized Coefficients	t	sig.
	B	Std. Error	Beta		
(Constant)	1.245	.284		4.392	.000
1 NPGOS	.350	.110	.367	3.191	.002
AC	.372	.109	.394	3.427	.001

a. Dependent Variable: OSL
(Source: Author)

Table 4: Residuals statistics

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	2.2678	4.6375	3.3607	.54290	70
Residual	-1.41775	1.13741	.00000	.57094	70
Std. Predicted Value	-2.013	2.352	.000	1.000	70
Std. Residual	-2.447	1.963	.000	.985	70

a. Dependent Variable: OSL
(Source: Author)

Table 5: ANOVA statistics for model

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	20.337	2	10.169	30.290	.000 ^b
	Residual	22.492	67	.336		
	Total	42.829	69			

a. Dependent Variable: OSL b. Predictors : (Constant), NPGOS
(Source: Author)

OBSERVATIONAL ANALYSIS

Results from the regression indicate that there is strong evidence in support of the study hypothesis, as the independent variables (NPGOS and AC) have a substantial impact on the overall satisfaction level. Along with the reported responses from older adults, several issues were also observed by the author which affirmed the responses of lower satisfaction for the traffic and accessibility conditions. Older adult residents reported good satisfaction with the planned public and green spaces in Jaipur city. Visiting religious buildings like temples was also considered a daily outdoor activity and an opportunity for many older adults to engage in social interactions. Most of the religious buildings, bazaars, and other places of daily outdoor activity had visitability issues in the heritage areas of the city in the absence of lifts and ramps for access for older adults using some walking aids. While the reported satisfaction levels for the availability of green open spaces were considerably higher, amenities like the provision of clean filtered water and age and disabled-friendly toilets within the public and green open spaces were observed to be lacking. Hygiene in such facilities was also a matter for concern. In absence of any signage, easily locating such facilities was also a concern, along with the maintenance of such facilities, which was reported as unsatisfactory by most older adults. While the overall satisfaction from the availability and quality of green open spaces along with the amenities provided within such spaces was found to be satisfactory, accessibility and walkability challenges were a matter of concern among majority of older adults. Although the proximity of the public and green open spaces to one's home environment was not considered a matter of concern, strenuous traffic conditions were regarded as a barrier to the comfortable walking experience by older adult residents. Two wheelers were seen to be driving in wrong direction at threatening speeds for older adults. Road crossings in different parts of cities lacked the provision of pedestrian user traffic signal systems. The absence of median islands on the roads and traffic-calming devices was observed to cause psychological and physical barriers to the walking experience through the neighbourhoods. Moreover, zebra crossings were generally obstructed by the vehicles and older adults were seen to be crossing busy roads at unsafe spots. Pedestrians and sidewalks were also obstructed by parked vehicles, and sidewalks lacked artificial lighting in a few spots. Buffers to safeguard pedestrian users from traffic were also not present along the busy roads, and bikers were seen driving recklessly on the pedestrian sidewalks. Maintenance concerns were also seen as a matter of concern

for smooth walking experiences in the outdoors. Pedestrian connectivity lacks various amenities like resting places, provision of benches, natural or artificial shading, clean and adequate potable water facilities, and washrooms at different locations; most older adults showcased a lower inclination towards carrying out the usual activities like walking and exercising.

DISCUSSION

The survey data and statistical analysis exhibit robust evidence supporting the notion that the perceived satisfaction levels of older adults are significantly influenced by the availability and quality of public and green open spaces (NPGOS) along with the accessibility conditions (AC), as postulated by various researchers in their studies (Dallat *et al.*, 2014; de Vries *et al.*, 2013; Yang *et al.*, 2021). A higher correlation indicates neighbourhood public green open spaces to have a strong influence on the overall satisfaction levels among older adults. The data can also be understood to underscore the influence of ease of accessibility and walkability conditions on the linkages between the home environment to the neighbourhood public and green open spaces. Urban policies have focused on developing wider roads to increase the infrastructure demands for an increasing number of vehicles in cities, but in the absence of pedestrian safety provisions on such road networks, such pedestrian infrastructures become inaccessible to pedestrian users, particularly older adults and persons with disabilities. Walkability enhancements within and around the neighbourhood environments can have the benefit of offering opportunities for leisure activity and socializing, but it also provides an indisputable benefit of bolstering their psychological positivity to be functionally independent. (Kim *et al.*, 2024). The study aligns with the findings of numerous researchers that emphasize the benefits of planning age-friendly public and green open spaces in the compact environment of the neighbourhoods as the means to promote social inclusion among older adults (Kim *et al.*, 2024). Our study highlights the need for enhancing safety for independent mobility. Such threats are largely evident in heritage neighbourhoods, where traffic volumes remain high and mostly uncontrolled. In line to the findings of Yung *et al.*, (2016), our study highlights the benefits for providing pedestrian amenities along the pedestrian networks improves the walking experience among older adults. Benefits of planning green open spaces in home proximity is associated with opportunities of social connectedness thus improving mental health of older adults and thus our study thus aligning with Del Aguila, (2021).

Additionally, the study supports the notion that despite the quality of public open space, obstacles to active mobility, such as hazardous and uncontrolled traffic conditions and unfavourable pedestrian conditions, pose a significant psychological challenge for older adults who wish to engage in outdoor activities (Rehal *et al.*, 2024).

CONCLUSION

The study seeks to elucidate the correlation between the availability of neighbourhood level green open space and the ability to engage in outdoor physical activity. The findings of the public opinion surveys reveal that most of the outdoor engagement in the green open spaces among the older adults are predominantly influenced by the accessibility conditions. The pedestrian networks quality between home and outdoor green open spaces are the most important facility that have the potential to encourage or impede daily outdoor physical activity. Poorly planned pedestrian amenities often deteriorates the independent walking experiences. Poorly developed road crossings are the biggest threat for older adults both in the walled city and the contemporary city. Furthermore, when green open spaces are located in the home proximity without necessitating traffic crossings, the outdoor activity experience becomes exceptionally comfortable and conducive to most older adults.

When independent mobility abilities decline, a support from the family members is important asset for assisted walking to the green open spaces and as such the joint family becomes a crucial support for daily engagements. The role of urban design and universal design thus becomes crucial for designing age-friendly urban green open spaces and their linkage routes. The study makes a crucial contribution to measure the role of green open space availability and accessibility conditions in urban areas of Jaipur city, India. Further, the study despite the study

Despite a smaller sample size, attributed to psychological constraints exhibited by older adults, the study serves as a significant resource for urging planners and designers to plan age-friendly green open spaces and create pedestrian-friendly outdoor conditions in urban built environments in India, thereby fostering equitable opportunities for social engagement and physical activity among older adults including differently abled persons.

The authors endeavour to test the generalisability of the study in a multiple-city survey approach as a prospective direction of research.

CONFLICT OF INTEREST

No conflict of interest was declared by the author

REFERENCES

- Dallat, M. A. T., Soerjomataram, I., Hunter, R. F., Tully, M. A., Cairns, K. J., & Kee, F. (2014). Urban greenways have the potential to increase physical activity levels cost-effectively. In *EUROPEAN JOURNAL OF PUBLIC HEALTH* (Vol. 24, Issue 2). <https://doi.org/10.1093/eurpub/ckt035> WE - Science Citation Index Expanded (SCI-EXPANDED) WE - Social Science Citation Index (SSCI)
- de Vries, S., van Dillen, S. M. E., Groenewegen, P. P., & Spreeuwenberg, P. (2013). Streetscape greenery and health: Stress, social cohesion and physical activity as mediators. *Social Science & Medicine*, *94*, 26–33. <https://doi.org/10.1016/j.socscimed.2013.06.030>
- Del Aguila, M. (2021). Neighbourhood environment walkability and the independence of older people: A comment on the 30-year plan for greater Adelaide. In *Australian Planner* (Vol. 57, Issues 3–4). Routledge. <https://doi.org/10.1080/07293682.2021.2017993>
- Kim, Y., Yeo, H., & Lim, L. (2024). Sustainable, walkable cities for the elderly: Identification of the built environment for walkability by activity purpose. *Sustainable Cities and Society*, *100*, 105004. <https://doi.org/10.1016/J.SCS.2023.105004>
- Lee, A. C. K., Jordan, H. C., & Horsley, J. (2015). Value of urban green spaces in promoting healthy living and wellbeing: prospects for planning. *Risk Management and Healthcare Policy*, *8*, 131. <https://doi.org/10.2147/RMHP.S61654>
- Liu, Y., Pan, Z., Liu, Y., & Li, Z. (2023). Can living in an age-friendly neighbourhood protect older adults' mental health against functional decline in China? *Landscape and Urban Planning*, *240*, 104897. <https://doi.org/10.1016/j.landurbplan.2023.104897>
- Meetiayagoda, L. (2018). Pedestrian safety in Kandy Heritage City, Sri Lanka: Lessons from World Heritage Cities. *Sustainable Cities and Society*, *38*, 301–308. <https://doi.org/10.1016/J.SCS.2018.01.017>
- Mercader-Moyano, P., Flores-García, M., & Serrano-Jiménez, A. (2020). Housing and neighbourhood diagnosis for ageing in place: Multidimensional Assessment System of the Built Environment (MASBE). *Sustainable Cities and Society*, *62*. <https://doi.org/10.1016/J.SCS.2020.102422>
- Rehal, P., Chani, P. S., Atreya, S., & Sehgal, V. (2021). Ageing-Friendly Neighbourhoods: A Study of Mobility and Out-of-Home Activity. *Lecture Notes in Civil Engineering*, *113*, 267–280. https://doi.org/10.1007/978-981-15-9554-7_24/COVER
- Rehal, P., Chani, P. S., Atreya, S., & Kaur, H. (2024). Determining the physical environment and safety influencers for active ageing and ageing-in-place in heritage city cores in the walled city of Jaipur, India. *Cities & Health*, 1–18. <https://doi.org/10.1080/23748834.2024.2436699>

- Salmistu, S., & Kotval, Z. (2023). Spatial interventions and built environment features in developing age-friendly communities from the perspective of urban planning and design. *Cities*, *141*, 104417. <https://doi.org/10.1016/j.cities.2023.104417>
- Steels, S. (2015). Key characteristics of age-friendly cities and communities: A review. *Cities*, *47*, 45–52. <https://doi.org/10.1016/j.cities.2015.02.004>
- WHO. (2007). *Global Age-friendly Cities: A Guide*. https://www.who.int/ageing/publications/active_ageing/en/
- Yang, L. C., Liu, J. X., Liang, Y., Lu, Y., & Yang, H. T. (2021). Spatially Varying Effects of Street Greenery on Walking Time of Older Adults. In *ISPRS INTERNATIONAL JOURNAL OF GEO-INFORMATION* (Vol. 10, Issue 9). <https://doi.org/10.3390/ijgi.10090596> WE - Science Citation Index Expanded (SCI-EXPANDED)
- Yung, E. H. K., Conejos, S., & Chan, E. H. W. (2016). Social needs of the elderly and active aging in public open spaces in urban renewal. *Cities*, *52*, 114–122. <https://doi.org/10.1016/j.cities.2015.11.022>
- Zhang, Y., Koene, M., Chen, C., Wagenaar, C., & Reijneveld, S. A. (2024). Associations between the built environment and physical activity in children, adults and older people: A narrative review of reviews. *Preventive Medicine*, *180*. <https://doi.org/10.1016/j.ypmed.2024.107856>