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Barriers to the Use of Public Transportation among Older Adults in Lahore, Pakistan: A Psychological Perspective

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Abstract

Transport is crucial for healthy aging; however, majority of the older adults are dependent on others globally, particularly in developing countries. Age-sensitive transport is essential for positive experiences, with psychosocial factors impacting the public transport use. Therefore, the current study focused on psychological factors as to why the older adults in underdeveloped nations, such as Pakistan, find it difficult to use public transportation. Data was collected from 384 people aged 60 or over in Lahore, Pakistan through a questionnaire survey using simple random sampling. Descriptive statistics, *t*-tests, and ANOVA were employed to assess the socioeconomic characteristics and mean differences in psychosocial factors across various demographics including age, gender, and socioeconomic status using SPSS software. Statistical results indicated that due to the lack of age-sensitive infrastructure, older adults possess poorly perceived norms, unfavorable beliefs and attitudes, and limited personal ability to use public transportation. T-test and ANOVA results further indicated that aged people had more negative attitude, while the lower-income and lesser-educated older adults perceived the norms positively and were more likely to use public transport services. Hence, the findings clearly explained the interplay of socio-physical barriers in public transport environment which significantly influences the older adults' psychological perspectives. The current study suggested that soft and hard transport interventions should be implemented together. This is because they are crucial to inducing positive public transport services for older adults.

***Keywords*:** barriers, Lahore, older adults, psychosocial, public transport

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Introduction

The global-aged population is increasing with every passing day. The population of older adults (aged 60 and above) is estimated to grow by 1.4 billion and about 2.1 billion by 2050. One in six individuals would reach 60 years of age or older by 2030. Two-third of the population over 60 years would reside in middle-income and low-income countries by 2050, and this percentage is rising more quickly as compared to developed nations. Additionally, it has been predicted that eight out of ten older adults worldwide would be residing in developing countries. Moreover, older persons in developing countries are expected to experience a two-times increase, with a population aged 60 or over likely to grow from about 549 million in 2017 to almost 1.3 billion in 2050 (United Nations, 2017a, 2017b; World Health Organization, 2022).

Demographic transitions, such as the increased population of older adults aged 60 or over have caused a structural lag in several developing economies, and the absence of institutional capacities and structures to fulfil the mobility needs of older adults (Jafree et al., 2023). In developing nations, access to public transport is poorer, particularly in South Asia, decreasing older adults' mobility and participation in economic and social welfare prospects (Patil et al., 2020). Many studies have focused on older adults to determine the mobility obstacles pertaining to public transport services. For instance, Jahangir et al. (2021) showed that the older adults often face complications getting on and off of buses due to over-crowding and traffic. Likewise, Ramachandran and D'Souza (2016) underlined that the older adults in India barely use public transport due to diverse barriers covering boarding alighting issue, lack of adequate seating, and congestion. Similarly, Parida et al. (2021) also highlighted the lower mobility of older adults in Bangladesh due to lack of age-sensitive public transport infrastructure.

Pakistan is the 5th most populous country globally, with a share of the world's population of almost 3% (United Nations, 2022). The country's total population would be about 241 million in 2023, which was 207 million in 2017 (Pakistan Bureau of Statistics, 2023). Moreover, Pakistan was ranked as the 5th worst country for older adults (Tariq et al., 2023). Since 1990, there has been a demographic shift in Pakistan (Sathar & Casterline, 1998). A constant decrease has been witnessed in mortality with a subsequent increase in life expectancy and a considerable decline in the total fertility

rate in recent years (Ali & Hussain, 2002). The population aged 60 and over would grow from 5.8% in 2000 to 7.3% in 2025 and 12.4% in 2050 (Saeed et al., 2011). This estimated increase would raise enormous challenges for urban and transport planners to ensure suitable mobility options for older adults (Hess, 2009).

Lahore is the 2nd largest city of Pakistan. The city's total population comprised almost 13 million inhabitants, with a total area of about 1772 km^2 (Pakistan Bureau of Statistics, 2023). District-level census reports indicate that the proportion of older adults varies between 3.2% and 8.9% (Qureshi, 2012). However, the mobility situation for older adults in Lahore has worsened due to rapid urban development and automobile ownership. The city has been growing unplanned due to rapid urbanization, and in 2017, its radius reached a length of 38 kilometers (Nadeem et al., 2021, 2023). In 2017, private automobiles accounted for more than 95% of all motor vehicles, while public transportation comprised less than 5% (Punjab Bureau of Statistics, 2017).

Several sectors, such as transport and land use planning, influence world's aged population. Older adults tend to show various traveling behaviors as compared to other society segments (Ravensbergen et al., 2022). Moreover, older adults are likely make fewer and shorter trips (Moniruzzaman et al., 2013). It has been noticed that one-third of the aged people account for unmet mobility needs because they mostly visit family and friends, which goes unfulfilled (Luiu et al., 2016). Therefore, the majority of older adults prefer driving over walking, cycling, and public transportation when travelling to distant places since cars are an easy and quick mode of transportation for them (Musselwhite & Shergold, 2013). It leads to various adverse outcomes, such as limited activity participation outside the home, reduced quality of life, and poor mental health (Qin et al., 2020). Therefore, sustaining independent mobility is a vital policy among older adults to overcome negative outcomes. However, public transportation is an economical and environmentally friendly travel option for older adults, offering independent mobility (Ravensbergen et al., 2022).

In summary, the population of older adults is increasing, while the share of public transport is declining, creating barriers for older adults. Therefore, it is imperative to investigate the challenges of using public transport in people aged 60 or above. Therefore, the current study aimed to examine the barriers to using public transport among older adults utilizing a

psychological perspective. The remaining sections of the study have been structured as follows. Section 2 discusses the brief literature on barriers to using public transport in older adults. Section 3 focuses on research methodology, comprising sampling technique, measurement scales, data collection, and approach to data analysis. Section 4 offers the results of this study, whereas conclusion and recommendations have been discussed in the latter section.

Literature Review

Older adults may experience social exclusion due to a variety of psychosocial issues that prevent them from using public transportation (Al-Rashid, Goh et al., 2021). These obstacles comprise attitudes, habits, perceived norms, neighborhood social limitations, and personal ability (Al-Rashid et al., 2023). Older adults frequently find fixed-route transport as feasible, however, experience momentous obstacles (Peck, 2010). Car usage is normal in older adults due to little public transit support (Buys et al., 2012). However, inadequate public transportation may contribute to social isolation for those with mobility issues (Lamanna et al., 2019). Older adults experience various problems with public transport including lack of affordability, accessibility, reliability, and frequency (Bryanton et al., 2010; Curl et al., 2014; Nordbakke & Schwanen, 2015). Haustein & Siren (2015) identified various factors in older people's mobility patterns, such as individual characteristics (gender, age), socioeconomic aspects (income, education, employment status, retirement), living environment (built environment), health, car access, and attitudinal features. Sun and Lau (2021) offered a conceptual framework for older adults' mobility based on seven determinants, such as physical, psychosocial, environmental, and monetary factors, service community, and surrounding area. Moniruzzaman et al. (2013) found remarkable geographical changeability in the older adult's travel behavior in Montreal. They concluded that older adults with different demographic and socioeconomic profiles highlight significant intra-urban variability in walking and neighborhood design variables in affecting older people's mobility.

In literature, most past studies have revealed that older adults preferred to use cars rather than public transport. Szeto et al. (2017) examined spatiotemporal travel characteristics of older adults in Hong Kong. It was concluded that as people aged, they made shorter journeys, using taxis more often than public transportation, and the automated trip rate dropped

significantly (up to 74%). Sun and Lau (2021) investigated the barriers in a walking environment when older adults approached public transport in Hong Kong, such as narrow sidewalks, footbridges and undergrounds, long walking, seamless connection of escalators or lifts, pavement evenness, railing between road and pavement, street crossing, traffic signal time, and seat and rest areas. In European countries, older adults tend to use taxi and cars considerably than rail and buses (Haustein & Siren, 2015). Similarly, older adults used cars for most trips rather than walking and public transit in the United Kingdom and the United States (Ahmad et al., 2019). In comparison, older adults in China preferred to travel on foot (49%) and public transport (43%), while the share of car use was less than 1% (Hu et al., 2013). They offered various suggestions to improve older adults' mobility including transport and land use integration, sidewalks and other transport infrastructure improvements, and public transport accessibility.

To conclude, several studies focused on challenges to using public transport in older adults in developed countries, however, little is known in developing countries. Therefore, the current study contributed to the existing literature and examined the barriers to using public transport among people aged 60 or over in terms of psychological perspective in the setting of developing economies, particularly South East Asian countries, such as Lahore, Pakistan.

Methodology

Data

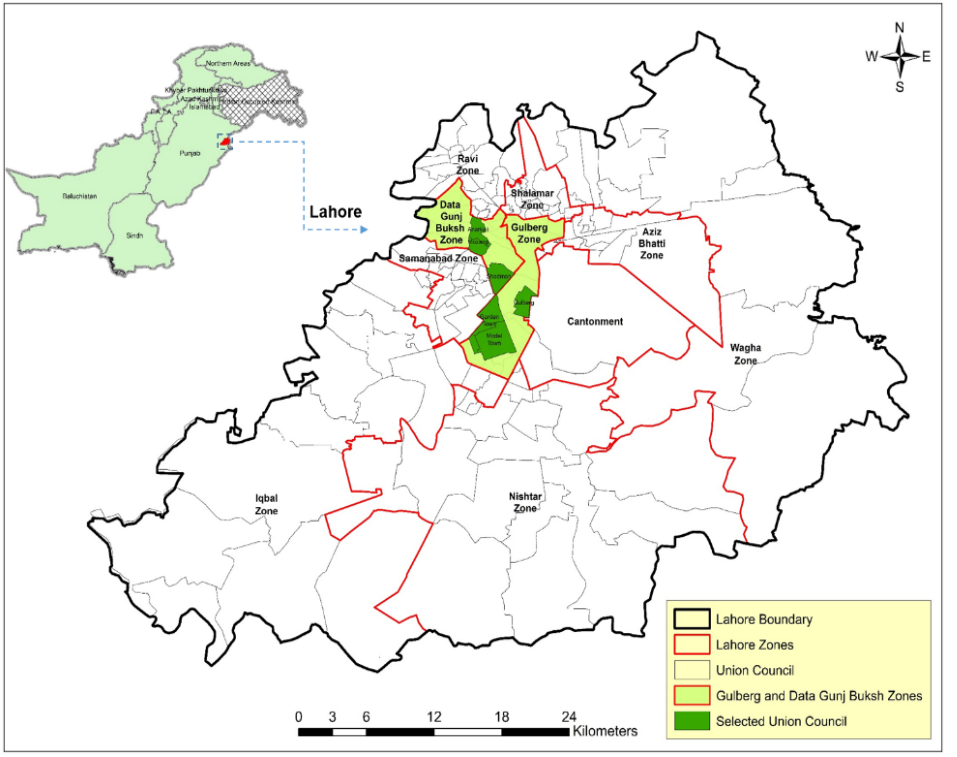
Lahore Metropolitan is delineated into ten zones including a containment zone. Each zone is further subdivided into union councils, referred to as blocks. The current study strategically focused on two specific zones, that is, Gulberg and Data Gunj Buksh. Six Union Councils were selected from these zones using a multistage sampling technique. In Gulberg, the chosen union councils included Model Town, Garden Town, and Gulberg III, while in Data Gunj Buksh, the study encompassed Mozang, Shadman, and Anarkali. The geographical distribution of these selected zones and Union Councils is illustrated in Figure 1.

The current study centered around the samples of 384 people aged 60 or above drawn from the selected union councils in Lahore. The selection process employed a simple random sampling technique, ensuring that each

individual in the target population has an equal chance of inclusion. A questionnaire survey administered in-person was employed to get the data.

Figure 1

Location of Study Area



Measurement Scales

The current study analyzed two components of perceived norms, such as social and personal. A 6-item scale was employed by Forward (2014) to analyze the social norms of public transport use. A four-item scale from (Bamberg et al., 2007) was used to calculate the personal norms of public transport use. The experiential and instrumental dimensions of attitudes about public transportation were measured using the seven-item scale developed by Wan et al. (2017). Fishbein et al. (2001) defined personal ability as comprising self-efficacy and perceived behavioral control. Perceived behavioral control was measured with a four-item scale, while self-efficacy was measured with a 13-item scale adapted from Chen et al. (2019) and de Geus et al. (2019). Likert scales, ranging from 1 for "strongly

disagree" to 5 for "strongly agree," were utilized for all of the scale items. A higher score indicates a greater degree of agreement with the items on the scale.

Data Analysis

Descriptive statistics were used to measure the socioeconomic characteristics of survey respondents. Tests were conducted using SPSS software to determine the differences between independent groups, with an emphasis on mean differences in psychosocial factors across a range of demographics, comprising gender, age, and socioeconomic status. This process likely involved conducting statistical tests, such as *t*-tests and ANOVA, to ascertain if there were significant disparities in psychosocial factors among distinct groups of older adults.

Results

Descriptive Statistics

The respondents involved in the current study comprised older adults selected from six union council areas in Lahore, Pakistan. The descriptive statistics showed that 51.8% of respondents were males and 48.2% were females. Most respondents were 60-64, while only 9.6% were 75 years old and above. About 30.8% of respondents were associated with the nuclear family structure, whereas 69.2% belonged to a joint family system. Roughly, 49.7% of respondents were unable to work or were unemployed, 37.7% were retired, and a negligible percentage was employed in full-time or part-time jobs. Approximately, 20% of respondents were illiterate, 39.8% had acquired high school qualifications, 23.9% were graduates, and only 14% had acquired post-graduate education. About 35.9% of respondents had income below PKR 25,000, 47.7% between PKR 25,000 and 74,999, and 6.2% between PKR 75,000 and 100,000. However, only 10.2% of the respondents had a monthly income of over PKR 100,000.

Different aspects of traveling characteristics of older adults were also identified. Findings suggested that majority of the older adults preferred using private transport modes, such as cars and motorbikes, while only 26% preferred using public transport. Albeit, public transport service was accessible for majority of the respondents within walking distance (500 m), the frequency of travelling with these modes was scarce. Thus, it showed that certain accessibility issues restrict the usability of public transportation modes among older adults.

Psychosocial Barriers

Perceived Norms

According to the measurement scale for social norms, the higher score represents more agreement among respondents. Overall, the results indicated respondents' disagreement with the statements provided, with a mean score of 2.071. It showed negative perceptions of older adults towards social norms of public transport. Thus, the analysis shows that older adults' peers and caretakers do not prefer public transport for daily activities. It is mainly because the existing public transport services in Lahore do not consider accessibility challenges and associated safety and privacy issues significant for older adults. Hence, due to various challenges, adults also receive less significant acceptance of public transport usage from their peers, limiting independent mobility.

Similarly, older adults generally showed disagreement towards the statements of personal norms, with an overall mean value of 1.654. The older adults agreed slightly more with the interjected norms than the integrated ones. Therefore, it can be revealed that older adults in Pakistan possess minimal moral obligations for public transport use. Notably, their beliefs do not inspire public transport use. Similarly, they do not anticipate guilt (such as feeling the environmental complications) connected with using private vehicles. Thus, the beliefs and anticipated pride in having or using personal vehicles might affect public transportation acceptance among older adults.

Personal Attitude

An attitude imitates a personal assessment of a given behavior's perceived advantages and disadvantages. Attitude towards public transport was measured to assess the perception of older adults in choosing public travel mode. The scale used to measure the public transport-related attitude depicted that the greater the score, the greater the agreement with the items would be. Table 1 shows a varying level of agreement with the experiential and instrumental attitudes. The analysis noted that the survey respondents positively perceived the environmental benefits (that is, instrumental features) of taking public transportation. Still, they were less satisfied with its experiential aspects. It can be said that although, older adults recognize the benefits of using public transport services, its poor service quality, and

lack of safety, privacy and accessibility issues shape the overall negative attitudes towards public transport.

Personal Ability

Based on the concept of Fishbein et al. (2001), personal ability (including self-efficacy and perceived behavioral control) connected with public transport travel was measured. A 17-item scale was used to examine the personal ability of older adults. Higher score indicates greater behavioral control and self-efficacy with public transport usage. Descriptive statistics (provided in Table 1) showed that older adults possess little agreement with the perceived behavioral control (mean = 3.026 $\pm$ 1.061). Similarly, self-efficacy towards public transport use is relatively low (mean = 2.356), where the external factors are more effective than internal factors. The analysis pointed out that older adults might experience barriers in an external and internal environment. For instance, older adults do not perceive the existing public transport services as user-friendly. Moreover, they feel unsafe while accessing these public transport modes, consequently affecting their ability to use public transportation.

Table 1
Descriptive Statistics for Psychosocial Factors

Items		Mean	Standard Deviation
Perceived Norms	Social Norms	2.071	1.168
	Personal Norms	1.654	1.156
Personal Attitude	Experiential Attitude	2.237	1.093
	Instrumental Attitude	2.888	0.944
Personal Ability	Perceived Behavioural Control	3.026	1.061
	Self-Efficacy	2.356	1.015

Test of Differences

Gender

Table 2 indicates gender differences in personal ability, public transport-related norms, and attitudes. t-test showed statistically significant gender differences between mean scores of 'public transport-related norms and attitudes among older adults. Therefore, it could be revealed that social norms and attitudes towards public transportation might be more substantial for older women than older men. The key reason for using public

transportation is the socio-cultural aspects influencing older women. However, older adults' ability to use public transit showed no significant gender differences.

Table 2

Gender Differences among Psychosocial Factors

Items (n = 384)	t-value	p
Perceived norms of public transport use	3.580	0.020*
Personal attitude to public transport	2.249	0.029*
Personal ability to use public transport	1.319	0.194

Note. $p < .05$.

Age

Table 3 summarizes the statistical differences of mean concerning age in the perceptions of socio-personal norms, personal attitudes, and ability to use public transportation. While determining the age of older adults, one-way ANOVA depicted the non-significant statistical differences for perceived norms of public transportation (F (4, 379) = 0.538, p = 0.709), and personal ability of older adults (F (4, 379) = 0.820, p = 0.519). However, only statistically significant differences were observed for public transport-related attitudes (F (4, 379) = 6.012, p = 0.001). Regarding the attitudes towards public transportation, Tukey's post hoc further revealed only a statistically significant difference between the age groups of 60 - 64 and 65 - 69 (p = 0.001).

Table 3

Differences in Psychosocial Factors Concerning Age

Items (n = 384)	F-value	p
Perceived norms of public transport use	0.538	0.709
Personal attitude to public transport	6.012	0.001*
Personal ability to use public transport	0.820	0.519

Note. $p < .05$.

Socio-Economic Status

Table 4 shows the difference between different income groups of older adults in personal ability, perceived norms, and public transportation attitudes. According to one-way ANOVA, the statistically significant differences were observed only for perceived norms [F (2, 381) = 3.552, p

= 0.037]. Nevertheless, there was no statistically significant difference among income groups for other psychosocial barriers.

Table 4

Differences in Psychosocial Factors Concerning Income Level

Items (n = 384)	F-value	p
Perceived norms of public transport use	3.552	0.037*
Personal attitude to public transport	2.926	0.063
Personal ability to use public transport	2.049	0.140

Note. $p < .05$.

A post hoc Tukey test showed that people with low and middle incomes differed significantly at p = 0.041 for public transport-related social norms. It follows that older adults with limited incomes may have favorable social norms and prefer to use public transport modes as compared to middle and high-income groups. However, on the other hand, all three income groups possessed statistically significant differences in the personal norms of public transport use. In this regard, Tukey's test revealed that the differences in perceptions of personal norms between low-income and middle-income groups were more significant (p = 0.004) than in the low-and high-income groups (p = 0.023).

Regarding the educational backgrounds of older adults, one-way ANOVA provided exciting results. Table 5 highlights the statistical differences in personal ability, perceptions of norms, and attitudes towards public transportation concerning educational backgrounds. Results suggested that among all the factors, only perceived norms of public transportation differed significantly across the educational experiences of older adults at p = 0.041. Additionally, it revealed that older adults with diverse academic backgrounds perceive public transport-related social and personal norms differently.

Table 5

Differences in Psychosocial Factors Concerning Education

Items (n = 384)	F-value	p
Perceived norms of public transport use	2.723	0.041*
Personal attitude to public transport	0.585	0.675
Personal ability to use public transport	1.416	0.244

Note. $p < .05$.

In looking at older adults' employment status, the results of one-way ANOVA showed statistically significant differences for all psychosocial factors (Table 6). The results determined that the perceived norms [F (3, 380) = 3.098, p = 0.036], attitude to public transportation [F (3, 380) = 2.943, p = 0.043], and personal ability [F (3, 380) = 4.298, p = 0.009] differed quite significantly across older adults of varied employment or occupation status.

Table 6

Differences in Psychosocial Factors Concerning Employment Status

Items (n = 384)	F-value	p
Perceived norms of public transport use	3.098	0.036*
Personal attitude to public transport	2.943	0.043*
Personal ability to use public transport	4.298	0.009*

Note. $p < .05$.

A post hoc Tukey's test revealed the detailed differences among various employment status groups. A post hoc Tukey test showed that full-time workers and retired older adults differed significantly at p = 0.043 and p = 0.074, respectively, for the perceived norms and attitudes to public transportation. However, the personal ability of older adults differed quite substantially from their employment status. Significant differences were observed between full-time and part-time workers (p = 0.090) and between retired older adults and full-time employment (p = 0.094).

Discussion

The current study distinctly examined the older adults' experiences of psychosocial factors related to public transportation. Statistical analysis revealed overall disagreement with the scale items provided in the social norm and personal norm variables. It showed the negative perceptions of older adults towards the perceived norms of public transport use. The descriptive statistics also demonstrated that the overall mean score for the public transport-related attitude was lower than the average, which indicates the negative attitude of older adults towards public transport modes. Similarly, the descriptive statistics indicated a higher disagreement with the self-efficacy and perceived behavioral control statements. Hence, it indicates that older adults in Pakistan have low confidence to deal with the public transport travel environment due to the challenges in accessing the public transport facilities.

To further reveal these barriers, the statistically significant differences concerning gender, age, and socioeconomic status were derived using a *t*-test and one-way ANOVA for each psychosocial factor. Results showed that the psychosocial barriers vary considerably across gender, age, and socioeconomic status. The findings illustrated that the social and personal normative barriers are more profound among older women than their male counterparts. Moreover, the findings are in-line with the existing literature which also demonstrated that the perceptions of social and personal norms significantly influence travel choice behaviors among older women (Al-Rashid, Harumain et al., 2021; Nordbakke, 2013). T-test and ANOVA results further indicated that the older women had a more negative attitude towards public transportation use. The results support the existing research (Namgung & Akar, 2014), which suggests that gender has a significant role in shaping the public transport-related attitude.

Regarding the age, the results indicated that statistically significant differences were only found for personal attitudes. It means that the more the age, the more negative attitude towards public transport services would be. In other words, the perceived inconvenience, fatigue, unreliability, and lack of availability of public transport services tend to have a more negative influence on aged people than their younger counterparts. Therefore, the more the age, the more they would feel difficulty in using public transportation and more they would feel wrong about public transport services. In line with (Dabelko-Schoeny et al., 2021), the findings of the current study also revealed that situational barriers significantly impact older adults' attitudes and intentions to use their private cars instead of public transport.

Older adults with lower income and less education perceived the norms positively and were more likely to use public transport services. These findings are also in-line with the existing literature (Loukaitou-Sideris et al., 2018) which states that the low-income older adults are more interested in using public transport services and can serve as a sustainable mode provided that the associated barriers are comprehensively addressed. Hence, the findings revealed the interplay between physical and social environment which has a significant impact on older adults' perceptions to use public transport services.

Conclusion

The overall objective of the current research was to analyze public transport-related psychosocial barriers among older adults. The significant contribution of this research is introducing the concept of the psychological barriers to public transportation in Pakistan. Previous studies conducted in the local context have primarily focused on the physical and situational aspects of public transport. By utilizing the psychological perspective, the current study provided novel and in-depth insights into how socio-environmental constraints negatively impact older adults' mobility with public transportation.

Data was collected from the selected union councils within the Lahore metropolitan, and a total sample of 384 aged 60 or over was included in this study. The descriptive statistics revealed that majority of the older adults disagreed with the statements provided in the scale items for psychosocial factors. The research encapsulated that psychosocial factors including poorly perceived norms, negative beliefs and attitudes, and lack of personal ability, negatively influence older adults' use of public transportation. Thus, these psychosocial barriers limit public transport usage in older adults.

Recommendations

The research recommends that soft and hard transport interventions are crucial to inducing positive public transport services among older adults. Some examples of soft transport measures include voluntary change measures, cognitive and behavioral approaches, and mobility management solutions. Instead, hard transport measures include infrastructure improvements, planning and operation of public transport services, exorbitant taxes for private vehicles, and car bans or restrictions in central business districts. The potential for soft transport policy measures to encourage and motivate individuals to switch to public transportation services increases with the implementation of hard transport policy measures. Therefore, age-responsive strategies leading directed essential initiatives and growing grassroots voluntary selection of public transport means are crucial to supporting the independent mobility among older adults.

Conflict of Interest

The authors of the manuscript have no financial or non-financial conflict of interest in the subject matter or materials discussed in this manuscript.

Data Availability

The data associated with this study will be provided by the corresponding author upon request.

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References

Ahmad, Z., Batool, Z., & Starkey, P. (2019). Understanding mobility characteristics and needs of older persons in urban Pakistan with respect to use of public transport and self-driving. *Journal of Transport Geography*, *74*, 181–190. https://doi.org/10.1016/j.jtrangeo.2018.11.015

Ali, M. S., & Hussain, J. (2002). Fertility transition in Pakistan: Evidence from census [with Comments]. *The Pakistan Development Review*, *40*(4), 537–550.

Al-Rashid, M. A., Goh, H. C., Harumain, Y. A. S., Ali, Z., Campisi, T., & Mahmood, T. (2021). Psychosocial barriers of public transport use and social exclusion among older adults: Empirical evidence from Lahore, Pakistan. *International Journal of Environmental Research and Public Health*, *18*(1), Article e185. https://doi.org/10.3390/ijerph18010185

Al-Rashid, M. A., Harumain, Y. A. S., Goh, H. C., & Ahmad, Z. (2021). Psychosocial factors of public transport users and social inclusion implications among older women in Pakistan. *Journal of Urban Planning and Development*, *147*(4), Article e04021046. https://doi.org/10.1061/(ASCE)UP.1943-5444.0000727

Al-Rashid, M. A., Harumain, Y. A. S., Goh, H. C., & Campisi, T. (2023). Psychosocial barriers to public transport use triggers older adults' social

exclusion: Empirical evidence from Pakistan. *Journal of Urban Planning and Development, 149*(1), Article e04022050. https://doi.org/10.1061/JUPDDM.UPENG-4097

Bamberg, S., Hunecke, M., & Blöbaum, A. (2007). Social context, personal norms and the use of public transportation: Two field studies. *Journal of Environmental Psychology*, *27*(3), 190–203. https://doi.org/10.1016/j.jenvp.2007.04.001

Bryanton, O., Weeks, L. E., & Lees, J. M. (2010). Supporting older women in the transition to driving cessation. *Activities, Adaptation and Aging*, *34*(3), 181–195. https://doi.org/10.1080/01924788.2010.501483

Buys, L., Snow, S., Van Megen, K., & Miller, E. (2012). Transportation behaviours of older adults: An investigation into car dependency in urban Australia. *Australasian Journal on Ageing*, *31*(3), 181–186. https://doi.org/https://doi.org/10.1111/j.1741-6612.2011.00567.x

Chen, W., Cao, C., Fang, X., & Kang, Z. (2019). Expanding the theory of planned behaviour to reveal urban residents' pro-environment travel behaviour. *Atmosphere*, *10*(8), Article e467. https://doi.org/10.3390/atmos10080467

Curl, A. L., Stowe, J. D., Cooney, T. M., & Proulx, C. M. (2014). Giving up the keys: How driving cessation affects engagement in later life. *The Gerontologist*, *54*(3), 423–433. https://doi.org/10.1093/geront/gnt037

Dabelko-Schoeny, H., Maleku, A., Cao, Q., White, K., & Ozbilen, B. (2021). "We want to go, but there are no options": Exploring barriers and facilitators of transportation among diverse older adults. *Journal of Transport & Health*, *20*, Article e100994. https://doi.org/10.1016/j.jth.2020.100994

de Geus, B., Wuytens, N., Deliens, T., Keserü, I., Macharis, C., & Meeusen, R. (2019). Psychosocial and environmental correlates of cycling for transportation in Brussels. *Transportation Research Part A: Policy and Practice*, *123*, 80–90. https://doi.org/10.1016/j.tra.2018.09.005

Fishbein, M., Von Haeften, I., & Appleyard, J. (2001). The role of theory in developing effective interventions: Implications from Project SAFER. *Psychology, Health & Medicine*, *6*(2), 223–238. https://doi.org/10.1080/13548500123176

Forward, S. E. (2014). Exploring people's willingness to bike using a combination of the theory of planned behavioural and the transtheoretical model. *Revue Europeenne de Psychologie Appliquee*, *64*(3), 151–159. https://doi.org/10.1016/j.erap.2014.04.002

Haustein, S., & Siren, A. (2015). Older people's mobility: Segments, factors, trends. *Transport Reviews*, *35*(4), 466–487. https://doi.org/10.1080/01441647.2015.1017867

Hess, D. B. (2009). Access to public transit and its influence on ridership for older adults in two U.S. Cities. *Journal of Transport and Land Use*, *2*(1), 3–27. https://doi.org/10.5198/jtlu.v2i1.11

Hu, X., Wang, J., & Wang, L. (2013). Understanding the travel behavior of elderly people in the developing country: A case study of Changchun, China. *Procedia - Social and Behavioral Sciences*, *96*, 873–880. https://doi.org/10.1016/j.sbspro.2013.08.099

Jafree, S. R., Burhan, S. K., Khawar, A., Mahmood, Q. K., & Shahed, S. (2023). The impact of intergenerational learning on quality of life in older populations residing in a public sector old age home: A quasi-experimental study. *Journal of Intergenerational Relationships*, *21*(1), 62–88. https://doi.org/10.1080/15350770.2021.1942383

Jahangir, S., Bailey, A., Hasan, M. U., Hossain, S., Helbich, M., & Hyde, M. (2021). "When I need to travel, I feel feverish": Everyday experiences of transport inequalities among older adults in Dhaka, Bangladesh. *The Gerontologist,* *62*(4), 493–503. https://doi.org/10.1093/geront/gnab103

Lamanna, M., Klinger, C. A., Liu, A., & Mirza, R. M. (2020). The association between public transportation and social isolation in older adults: A scoping review of the literature. *Canadian Journal on Aging*, *39*(3), 393–405. https://doi.org/10.1017/S0714980819000345

Loukaitou-Sideris, A., Wachs, M., Levy-Storms, L., & Brozen, M. (2018). *Transportation for an aging population: Promoting mobility and equity for low-income seniors*. Mineta transportation institute. https://core.ac.uk/download/pdf/215412024.pdf

Luiu, C., Tight, M., & Burrow, M. (2017). The unmet travel needs of the older population: A review of the literature. *Transport Reviews*, *37*(4), 488–506. https://doi.org/10.1080/01441647.2016.1252447

Moniruzzaman, M., Páez, A., Habib, K. M. N., & Morency, C. (2013). Mode use and trip length of seniors in Montreal. *Journal of Transport Geography*, *30*, 89–99. https://doi.org/10.1016/j.jtrangeo.2013.03.007

Musselwhite, C. B. A., & Shergold, I. (2013). Examining the process of driving cessation in later life. *European Journal of Ageing*, *10*(2), 89–100. https://doi.org/10.1007/s10433-012-0252-6

Nadeem, M., Aziz, A., Al-Rashid, M. A., Tesoriere, G., Asim, M., & Campisi, T. (2021). Scaling the potential of compact city development: The case of Lahore, Pakistan. *Sustainability*, *13*(9), Article e5257. https://doi.org/10.3390/su13095257

Nadeem, M., Matsuyuki, M., & Tanaka, S. (2023). Impact of bus rapid transit in shaping transit-oriented development: Evidence from Lahore, Pakistan. *Journal of Asian Architecture and Building Engineering*, *22*(6), 3635–3648. https://doi.org/10.1080/13467581.2023.2172341

Namgung, M., & Akar, G. (2014). Role of gender and attitudes on public transportation use. *Transportation Research Record*, *2415*(1), 136–144. https://doi.org/10.3141/2415-15

Nordbakke, S. (2013). Capabilities for mobility among urban older women: Barriers, strategies and options. *Journal of Transport Geography, 26*, 166–174.

Nordbakke, S., & Schwanen, T. (2015). Transport, unmet activity needs and wellbeing in later life: Exploring the links. *Transportation*, *42*(6), 1129–1151. https://doi.org/10.1007/s11116-014-9558-x

Pakistan Bureau of Statistics. (2023). *Announcement of results of 7th population and housing census-2023 'the digital census.'* https://www.pbs.gov.pk/sites/default/files/population/2023/Pakistan.pdf

Parida, D., Khan, R. R., & Neethilavanya, K. (2021). Exploring the relationship between the urban built environment and elderly pedestrian mobility in South Asian cities. *Research Square*. Advanced online publication. https://doi.org/10.21203/rs.3.rs-848582/v1

Patil, D. S., Yadav, U. N., George, S., Helbich, M., Ettema, D., & Bailey, A. (2020). Developing an evidence-informed framework for safe and accessible urban mobility infrastructures for older adults in low-and

middle-income countries: A protocol for realist synthesis. *Systematic Reviews*, *9*(1), 1–6.

Peck, M. D. (2010). *Barriers to using fixed-route public transit for older adults*. MINETA Transportation Institute. https://trid.trb.org/View/935558

Punjab Bureau of Statistics. (2017). *Punjab development statistics 2017*. http://www.bos.gop.pk/

Qin, W., Xiang, X., & Taylor, H. (2020). Driving cessation and social isolation in older adults. *Journal of Aging and Health*, *32*(9), 962–971. https://doi.org/10.1177/0898264319870400

Qureshi, K. (2012). *Ageing: Gender, Social class and health in Pakistan*. Center for Public Policy and Governance. http://cppg.fccollege.edu.pk/publications/ageing-gender-social-class-and-health-in-pakistan/

Ramachandran, M., & D'Souza, S. A. (2016). A cross-sectional survey on older adults' community mobility in an Indian metropolis. *Journal of Cross-Cultural Gerontology*, *31*(1), 19–33. https://doi.org/10.1007/s10823-015-9276-7

Ravensbergen, L., Van Liefferinge, M., Isabella, J., Merrina, Z., & El-Geneidy, A. (2022). Accessibility by public transport for older adults: A systematic review. *Journal of Transport Geography*, *103*, Article e103408 https://doi.org/10.1016/j.jtrangeo.2022.103408

Saeed, Y., Shoaib, M., & Ilyas, R. (2011). Discrimination and health status of elderly people in Chakwal: Pakistan. *Academic Research International*, *1*(3), 149–155.

Sathar, Z. A., & Casterline, J. B. (1998). The onset of fertility transition in Pakistan. *Population and Development Review*, *24*(4), 773–796. https://doi.org/10.2307/2808024

Sun, G., & Lau, C. Y. (2021). Go-along with older people to public transport in high-density cities: Understanding the concerns and walking barriers through their lens. *Journal of Transport and Health*, *21*, 1–16. https://doi.org/10.1016/j.jth.2021.101072

Szeto, W. Y., Yang, L., Wong, R. C. P., Li, Y. C., & Wong, S. C. (2017). Spatio-temporal travel characteristics of the elderly in an ageing society.

Travel Behaviour and Society, *9*, 10–20. https://doi.org/10.1016/j.tbs.2017.07.005

Tariq, J., Zakar, R., Ali, M. V., Zakar, M. Z., Sajjad, A., & Fischer, F. (2023). Determinants of physical, psychological, and social well-being in older adults: A cross-sectional study in senior care facilities of Pakistan (2019/20). *BMC Geriatrics*, *23*, e349. https://doi.org/https://doi.org/10.1186/s12877-023-04014-w

United Nations. (2017a). *Population ageing and sustainable development*. https://www.un.org/en/development/desa/population/publications/pdf/popfacts/PopFacts_2017-1.pdf

United Nations. (2017b). *World population ageing 2017: Highlights*. https://doi.org/10.18356/10e32e81-en

United Nations. (2022). *World population prospects: The 2022 revision*. Worldometer. https://www.worldometers.info/world-population/population-by-country/

Wan, C., Shen, G. Q., & Choi, S. (2017). Experiential and instrumental attitudes: Interaction effect of attitude and subjective norm on recycling intention. *Journal of Environmental Psychology*, *50*, 69–79. https://doi.org/10.1016/j.jenvp.2017.02.006

World Health Organization. (2022, October 1). *Ageing and health*. https://www.who.int/news-room/fact-sheets/detail/ageing-and-health