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TRAVELLING HABITS AND PERCEIVED LIMITATIONS OF OLDER CITY BUS USERS

ABSTRACT

The purpose was to investigate the interrelation between the age of older city bus users, their travelling habits, their estimated physical (dis)abilities and perceived safety during the trip using the Ljubljana public transportation system. Methods: 101 older bus users agreed to participate in a street survey by answering a questionnaire. Results indicate that the habits of bus users are not age dependent. The frequency of public bus use, the walking distance to the nearest bus stop, the estimated physical abilities and perceived physical limitations of the bus users were not associated to the chronological age. Respondents reported on average 3±1.6 perceived physical limitations and 37% of them perceived their travelling habits to be affected by their physical limitations. While decreased perceived safety during the bus journey was significantly related to the chronological age: significantly more bus users of the oldest-old group reported not having enough time to occupy a seat before the bus drove off, although a significantly higher proportion of older-old adults were offered a seat by their fellow travellers. In conclusion, the perception of physical fitness and health problems are more important contributing factors for the use of public transportation than the chronological age.

KEY WORDS

elderly; public transportation users; habits; limitations;

1. INTRODUCTION

The need of travelling and enjoying the family and social interaction are preserved well into old age despite the increasing limitations. Since ageing, and consequently personal limitations and impairments, reduce the accessibility and usability of public transportation, the transportation authorities, providers and planners should understand the changing needs of elderly transportation users. By the most commonly accepted definition the term older person refers to a person older than 65 years [1] and the diversity of old age is further recognised by defining three sub-groups: young-old (60 - 69 years), middle-old (70–79 years), and oldest-old (80 years and over) [2]. With ageing

more persons need to change the means of transportation, mostly by shifting from the use of private cars to public transportation, buses included [3]. This shift is partially the result of changes in physical, sensory and cognitive abilities that can significantly decrease the elderly person's mobility. Typically, the accuracy of vision and hearing [4] as well as gait speed [5] decrease with ageing and adding a second, usually cognitive task, further influences their perception and gait speed [6]. It has been recognised that with the advanced age the number of trips by public transportation decreases as do the travelled distances [7]. As reported by Preston and Raje [8] in the United States 36.4% of public transportation users are over 65 years old, in Germany 35.8% of users are elderly adults with higher percentage of women as compared to men travellers. After the year 2000 a trend of slightly decreasing percentage of elderly bus users has been noted [8].

Therefore, the quality, accessibility, usability and affordability of public transportation is an important indicator of the quality of life of the elderly. Given the increased number of elderly especially in metropolitan areas the potential of mobility for elderly is an important challenge for the transportation planners.

Within the next few years it is expected that the need for public transportation for older adults will further increase due to the increase of elderly population. Namely, it has been estimated that by the year 2050 in OECD countries on the average 25% of the population will be of that category and more particularly 20% in Slovenia. This increase is expected to be even higher in the metropolitan areas [9]. As the elderly population group is highly heterogeneous [10] it is reasonable to expect that their travel needs will also widely differ in relation to their motor, sensory and cognitive functions [10]. Quite a few European cities have engaged in the so-called age-friendliness policy which is an approach aimed to make the services and environments more usable for the specific needs of older people and thus promoting improved opportunities for their social

participation, active ageing and health [1]. One of them is Ljubljana, central European city with the population of 280,000, out of which 24% older than 60 [11]. In 2013 an initiative was issued aimed to transform it into an elderly friendly city [12]. This initiative included goals to increase the accessibility of the public transportation for elderly inhabitants and among others resulted in instructing the elderly public transportation users about their safety during boarding, transportation and embarking [13].

The accessibility of Ljubljana public transportation can be considered as good since 92.1% of the inhabitants live within the range of 500 m to the nearest bus stop [14]. More recent data indicate that 42.2% of the inhabitants consider the services as excellent, and further 40.6% as very good to good, while for those who live in the suburban areas (17.2%) however is the service less accessible due to longer walking distances to the nearest bus stop and lesser frequency of the services [15]. In an effort to make the public transportation more friendly for the elderly inhabitants we decided to study the habits and perceptions of the elderly bus service users. As the elderly are expected to be a very heterogeneous population the purpose of the present work was thus to find out how the travelling habits and the perceptions of Ljubljana public transportation system depend on age and perceived physical limitations among elderly bus service users. As Ljubljana is a fairly typical Central European city the results are expected to have more than local significance. The goal of our survey was to evaluate the habits of elderly bus users with respect to their chronological age in the context of perceived limitations. We hypothesised that the chronological age per se is not the most important factor for the habits of bus users. The second goal was to evaluate the safety aspect of older bus users in the context of the time to drive off related to the possibility to occupy a seat. We hypothesised that this is age-dependent.

2. METHODS

The habits and perceptions of elderly Ljubljana city transportation users was investigated through a questionnaire. For this purpose, a Scandinavian questionnaire [16] was translated, adapted and validated. This particular questionnaire was chosen because of the advanced public transportation status in Scandinavia [16]. Besides, the city of Borås (Sweden) for which this questionnaire was developed, has similar population density as Ljubljana though a smaller number of inhabitants [17, 18]. The questionnaire that consisted of 12 multiple-choice questions was first validated on a small sample of Ljubljana older adults public transportation users. Its validated version was then implemented as a questionnaire that was read and marked by previously trained volunteers among randomly chosen

elderly bus service users. The survey was conducted in May, on working days in the morning and early afternoon when the weather was sunny. The questions were divided into three subgroups: participants travelling habits (frequency of use, distance and time to the nearest bus stop), the perceived physical fitness (physical ailment, use of walking aids, estimated capacity for walking without resting, time needed to the nearest bus stop), and the sitting habits as a function of safety during the trip (offering the seat by fellow bus users, time for occupying a seat). The answers to the questions were either of the multiple-choice type, yes or no type, or open questions.

The bus users in Ljubljana were approached upon completion of the journey or while waiting for a bus at a bus stop. The participants were approached in the city centre at different bus stops (the city centre, near hospital and near the market place) of six different bus lines. The inclusion criteria for the analysis was the age of 60 years or older. For further analysis, respondents were divided into three groups: young-older adults (60 - 69 years), middle-age older adults (70 – 79 years) and the old-older adults (80 years and over) [2, 3]. The subgroup analysis stratified by respondents' age was performed for those three age groups and the sample of the participants is regarded as the convenience one.

The 101 analysed questionnaires resulted from 115 approached older public bus users who agreed to answer the questions. Out of them 14 had to be excluded since it turned out that they were younger than the pre-set minimum age of 60 years. The average age of the remaining group was 74.2 ± 7.1 years, 30% of them were males and 70% females. Further splitting into the age groups resulted in 36.6% young-older adults, 38.6% middle-aged older adults and 24.8% old-older adults.

The Statistical Package for Social Sciences (SPSS 23, SPSS Inc., Chicago, IL, USA) was used for statistical analysis. Descriptive statistics and chi square was used for the calculation of the interrelation of the variables and determining significant differences between age groups. A one-way ANOVA was used to investigate time to the nearest bus stop. The level of significance was set at $p < 0.05$.

3. RESULTS

3.1 Travelling habits

Frequency of the public bus use by the respondents was on the average 37.6% daily, 41.6% weekly, 8.9% monthly and 11.9% use seldom public transportation. The detailed frequencies stratified by age are presented in *Table 1*. On the average the respondents reported performing 9±6.7 one-way journeys per week using the services of Ljubljana public transportation.

The frequency of public transportation usage was not significantly related to age group of the respondents $\chi^2_{(6)}$=3.545, p=0.738.

Table 1 – Reported frequencies of bus usage stratified by age expressed as percentage

Frequency of bus usage	60 – 69 years	70 – 79 years	80 years and older
daily	40.5	30.8	44.0
weekly	37.8	51.3	32.0
monthly	8.1	10.3	8.0
seldom	13.5	7.7	16.0

The bus users most often walk 50 to 150 metres (34.7% of respondents) to the nearest bus stop, followed by those with less than 50 metres (32.7%), between 150 and 300 metres (21.8%) and more than 300 metres (10.9%). The detailed frequencies stratified by age are presented in *Table 2*. No significant relation was found ($\chi^2_{(6)}$=3.547, p=0.734) between the distance to the nearest bus stop and the age group. The average reported walking time to the nearest bus stop was 6.9±4.2 minutes. The difference between the three age groups was not statistically significant ($F_{(2)}$=1.129, p=0.328).

Table 2 – Distance to the nearest bus stop stratified by age expressed as percentage

Distance to the nearest bus stop	60 – 69 years	70 – 79 years	80 years and older
Less than 50 m	29.7	33.3	36.0
Between 50 and 150 m	35.1	41.0	24.0
Between 150 and 300 m	21.6	20.5	24.0
More than 300 m	13.5	5.1	16.0

3.2 Estimated physical abilities

When asked to estimate their physical abilities the majority of the participants reported being able to walk more than 300 m. A significant interaction was found ($\chi^2_{(6)}$=13.942, p=0.030) between the age and the self-estimated walking distance. Thus, 78.4% of the young elderly and only 45% of the oldest elderly estimated their uninterrupted walking distance being 300 m or more. The detailed frequencies stratified by age are presented in *Table 3*. Additionally, 37% of the respondents reported the use of a kind of walking aid during outdoor walking, the most usual type of it was a walking cane followed by crutches. There was no statistically significant association between the age and the use of walking aids ($\chi^2_{(2)}$=4.431, p=0.109).

Table 3 – Reported distances of independent walking ability stratified by age expressed as percentage

Estimated walking distance	60 – 69 years	70 – 79 years	80 years and older
Less than 50 m	2.7	5.1	16.0
Between 50 and 150 m	8.1	28.2	20.0
Between 150 and 300 m	10.8	20.5	20.0
More than 300 m	78.4	46.2	44.0

When the respondents were asked about the type of their perceived physical impairments the most frequent answer was decreased vision, followed by various pain conditions, balance problems and some other, less frequent ones. The number of reported physical limitations per respondent ranged from 1 to 7, on average 3±1.6, while only 11% of the respondents reported no physical limitations. There was no statistically significant association between the age and the number of health problems ($\chi^2_{(16)}$=16.154, p=0.442). Of those who reported physical limitations, 37% perceived their physical limitations as such that made their travelling difficult (*Figure 1*). There was no statistically significant relationship ($\chi^2_{(2)}$=4.924, p=0.085) between the perceived health problems and the age group.
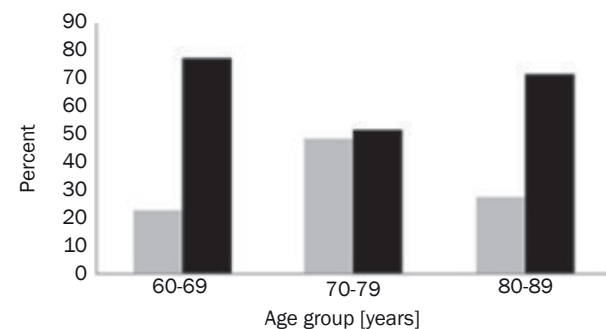

Figure 1 – The perception whether the physical limitations are hindering bus travelling (grey) or not (black)

3.3 Safety during the journey

Sitting during the journey was assessed with a question whether they could sit during the journey and whether they were offered a seat. There were 66.3% of the respondents who claimed that they were offered a seat, of those who were offered a seat, this was done voluntarily in 41.6% of cases and in 24.8% of cases upon request, whereas 33.7% of participants reported that they were not offered a seat. The detailed frequencies stratified by the age are presented in *Figure 2*. The middle-aged older group and the old-solder group are statistically significantly more frequently offered a seat by fellow passengers ($\chi^2_{(2)}$=5.890, p=0.053).

There were 83.2% of respondents who reported that they had enough time to take a seat before the bus drove off, while 16.8% reported that the time was not sufficient to safely sit down. The frequencies stratified by age are presented in *Figure 3*. There is significant association between the age group and the time to safely occupy a seat ($\chi^2_{(2)}$=6.650, p=0.036), indicating that older-old and young-old group need significantly more time to safely occupy a seat.
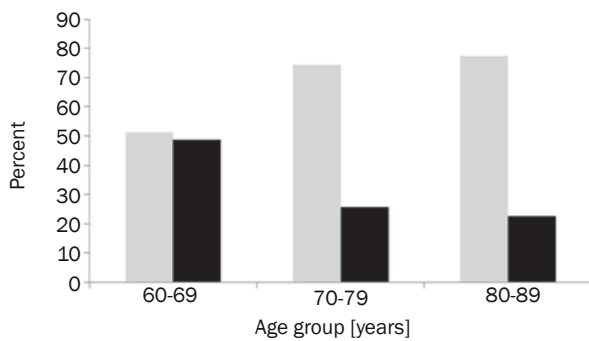

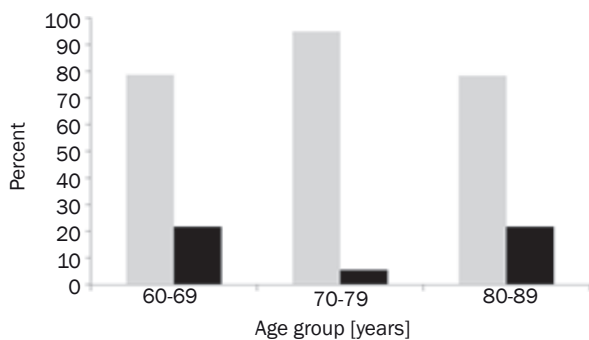*Figure 2 – Percentage of elderly bus users who were offered a seat (grey) and those who were not (black)*

Figure 3 – Percentage of elderly bus users who have enough time to sit down (grey) and those who do not (black)

4. DISCUSSION

The purpose of our survey was to define the travelling habits and limitations of elderly bus users as a function of age. In the context of bus users' limitations as expressed by the estimated uninterrupted walking distance was associated to age while the number of perceived physical limitations and the reported travelling habits were not associated with age of the participants. In the context of safety, the aspect of traveling by public transportation, the time required to occupy a seat, and the percentage of the participants who were offered a seat was strongly associated with the age of the participants.

In our on-spot street survey, the overall gender distribution of the participants was in favour of female bus users (70%). This gender distribution does not correspond to the gender distribution of Ljubljana citizens since there are 58.8% female inhabitants of the age of 60 and over in the city [11] and can be attributed to the travelling habits of the older public transportation users. Such a gender distribution of the bus users in Ljubljana corresponds to the one previously reported elsewhere. Namely, Kirk et al. [19] reported that there were three times more female bus users than male ones while Banister and Bowling [3] reported 60% of female bus users.

A majority (80%) of the survey participants frequently used bus services and could thus be regarded as regular users. Those who regularly used the bus were evenly distributed between the age groups while weekly users prevail in the 70 – 79-year group. Those who rarely use the bus service were evenly distributed throughout the age groups. Banister and Bowling [3] reported lesser number of very old regular public transportation users but our sample was specific for the city bus users and can differ from the one of long-distance travels. These results indicate that age per se is not the most important factor for the decision whether to use public transportation or not.

The distance to the nearest bus stop is one of the limiting factors for public transportation use [20]. The reported distances largely differ among the studies and range from 300 m [14] and up to 1,000 m [21] and the estimated distance of 400 m or more has been found to be the turning point for the decision whether or not to use the public transportation services [22]. In the present study, we opted for the 300 m range given that the users of public transportation studied here were elderly adults. However, the perceived distance of over 300 m to the nearest bus stop was reported significantly more often in the youngest age group. This result might indicate that younger elderly adults decide to use public transportation despite larger perceived distances to the nearest bus stop while the middle-old and oldest-old decide less frequently to use the bus service when their estimated distance to bus service is longer. The difference is probably even larger since the elderly persons have been found to usually overestimate the distance to the nearest bus stop by 20% [20]. This result agrees with the observation that the oldest-old often become dependent on family members [7] and have been found to decrease the number of trips [8]. Therefore, the estimated physical abilities were assessed as well in the present survey and significantly fewer participants in the oldest age group reported being able to walk more than 300 m indicating that the general fitness could be the reason for not using the bus services. The results of our study are in agreement with the previous research indicating that the general fitness is also an important factor for the frequency of public transportation use [23].

The mobility of elderly is challenged by the increase of motor or sensory disabilities. Physical limitations are known to decrease the frequency of public

transportation use [24]; therefore, the perceived limitations in the use of public transportation were assessed and indeed 37% of the respondents reported that their physical limitations such as balance problems, pain and sensory limitations affected their travelling. However, in the present sample the age and physical limitations were weakly correlated regarding the number of reported health conditions as well as perceived limitations of these health conditions for the usage of public transportation. These results indicate that regular public transportation use is not age but health and fitness dependent. For instance, physical limitations may enhance the difficulty of getting on and off the vehicles which is commonly reported as a major obstacle for the use of public transportation by elderly service users [25, 26]. In old age, different health conditions can lead to less frequent trips, and additional health conditions are also strongly correlated to the incidence of traffic injuries [24].

Standing during the journey and the speed of driver start-up is along with getting on and off the bus the major risk factor for balance loss, falls and consequent injuries [26]. The majority of non-collision injuries are known to happen during boarding, embarking and preparation for the embarking the bus [12]. It has also been reported that 9.4% of injuries happen during boarding and 17.2% during alighting and 29.7% of all injuries happen to the standing passengers [19]. Therefore, safety of public transportation users is a major concern of the service providers. Most of the respondents in the present survey reported to be able to sit during the journey and that they had enough time to occupy a seat. However, there are still 16.8% of the respondents who did not have enough time to sit before the bus drove off, and they are frequently in the older group. The short drive-off time and being a standing passenger were found to be two major risk factors for falls and consequent injuries in non-collision injuries of elderly bus users [19]. Therefore, elderly bus users are safer while sitting. Offering a seat to elderly bus users still remains an educational challenge since more than 20% in the age group between 80 and 89 years and as much as 48% in the age group 60 to 69 years were not offered a seat. We cannot attribute this to the misjudgement of the age since our study also clearly showed that young persons tended to overestimate the age of fellow travellers. Namely, as much as 14% of the bus users that were approached by our young collaborators had to be later excluded from the analysis due to their age being less than the required 60 years.

The practical results of this research and its usability are mainly aimed at the improvement of the public bus service. They may serve as the basis to prepare the instructions and the education for bus drivers in order to enhance their knowledge of the needs of elderly bus users and thus to prevent or at least decrease the rate and severity of non-collision accidents. Transport providers and transport planning authorities are expected to adjust their policies and action plans in accordance with the needs of elderly people. An age-friendly city with a policy approach aiming to make services (bus services included) and environments (paved footways, street crossings) more usable for the specific needs of the elderly people as well as persons with temporary disabilities is a goal for most of the European cities [1].

5. CONCLUSION

The limitation of the present study is in its rather small number of interviewed passengers and the choice of convenient sampling. The analysed data included only the bus users and could thus not be generalised to the total elderly adult population in the Ljubljana region – the results being valid for the actual users of public transportation. Based on our sample the reasons for non-use of bus service cannot be estimated. In the future the research including all the potential users and their reasons for not using bus services would add valuable data for the public transportation planners.

In conclusion, the habits of bus users were not age-dependent while the safety aspect on the other hand was age-dependent. Therefore, the time to drive off and the habit of offering a seat to elderly bus users are the two identified areas that need improvement in Ljubljana bus service. Adjustments of public transportation to accommodate the needs of motor and sensory impaired elderly passengers should be a priority to the service provider as living in a community with good public transportation is a "building block" of the quality of life [3].

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POTOVALNE NAVADE IN ZAZNANE OMEJITVE STAREJŠIH UPORABNIKOV MESTNEGA POTNIŠKEGA PROMETA

POVZETEK

Namen je bil raziskati soodvisnost med starostjo uporabnikov mestnega potniškega prometa, njihovimi potovalnimi navadami, lastnimi ocenami telesne (ne)zmožnosti ter

ocenami varnosti med potovanjem z javnim potniškim prometom v Ljubljani. Metode: 101 starejši uporabnik avtobusnih storitev se je odzval na vabilo k sodelovanju pri terenski raziskavi z odgovarjanjem na vprašalnik. Rezultati kažejo, da navade uporabnikov avtobusov niso odvisne od starosti. Pogostost uporabe avtobusa in razdalja do najbližje avtobusne postaje nista povezani s kronološko starostjo. Ocenjene telesne zmožnosti uporabnikov avtobusov prav tako niso povezane s starostjo in so razmeroma visoke, s povprečjem 3 ± 1,6 zaznanih telesnih omejitev. 37 % vprašanih meni, da te omejitve vplivajo na njihove potovalne navade vendar tudi tega mnenja ne moremo povezati s kronološko starostjo. Po drugi strani pa je zaznavanje varnosti bistveno povezano s starostjo potnikov: priložnost, da zasedejo sedež je močno povezana s starostjo starejših uporabnikov avtobusov saj bistveno večjemu deležu starejših starih odraslih sopotniki ponudijo sedež ter večina tistih, ki nimajo dovolj časa, da bi sedli, prav tako sodi v dve najstarejši skupini. Zaključimo lahko, da so zaznane telesne zmožnosti in zdravstvene težave bolj pomembni dejavniki, ki prispevajo k uporabi javnega prevoza kot kronološka starost.

KLJUČNE BESEDE

starostniki; uporabniki javnega prevoza; navade; omejitve;

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