

Pathology of The Disabled People Access to Public Transport and Prioritizing Practical Solution

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Abstract

Adaptation of urban facilities for disabled people is an essential need. Lack of adaptation leads to the isolation of the disabled and deprives society of their participation in various fields. Also, due to the impossibility of being in the community, these people lose the possibility of obtaining jobs and income, so they will suffer from severe financial problems and physical problems. For this reason, in developed countries, much attention is paid to the adaptation of public transportation for the disabled. In this study, the existing problems in the access of people with disabilities to public transport in Tehran have been investigated separately by Bus Rapid Transit(BRT), buses, and subways. Also, the actions for adapting have been identified. These actions have been prioritized and given a priority of 1 to 5. Questionnaires were evaluated using Cronbach's alpha in SPSS software. Based on the obtained results, Cronbach's alpha of the physical disability questionnaire was equal to 0.709, and Cronbach's alpha of the blind was equal to 0.711. Priorities were identified using 384 questionnaires that were answered by the disabled. Prioritization of the required adaptation measures of public transportation is evaluated according to the results of the questionnaires. Then, using SWOT analysis and examining the opportunities and threats, the weaknesses and strengths of the adaptation of public transportation for the disabled have been analyzed. The total final score for internal factors related to the provision of services in public transport for the disabled is 1.94, and external factors were 2.54. According to IE matrix, public transportation in Tehran needs growth and construction. Prioritization of the required measures for the adaptation of public transportation for the disabled, are evaluated according to the results of the questionnaires.

Key Words: Public Transportation, Disabled, Equity, Access.

Tob Regul Sci.™ 2021; 7(6-1): 7634-7643

DOI: doi.org/10.18001/TRS.7.6.1.82

1-Introduction

Accessibility is one of the essential features of a city. Today, solving access problems in cities and improving their quality is one of the main goals of cities and urban development(Andrews et al., 2018). This problem is solved by looking at all members of society, including the old, young, and disabled(Brumbaugh, 2018). Part of our society comprises people with physical disabilities and mobility disabilities. This group has shown its abilities in various fields of science, sports, and career(Boroujerdian et al., 2016). But Transportation systems are mainly designed to meet the needs of normal and healthy people in the community, and people with disabilities cannot benefit from

these facilities(Zhou et al., 2012). In this study, the pathology of the current public transportation situation for the use of disabled people is discussed. Then, executive solutions will be presented by mentioning the busiest stations for the disabled and prioritizing the solutions.

2. Review of literature

Transportation planning decisions can have large and diverse equity impacts. Evaluating these can be challenging because there are several types of equity and impacts to consider, and various ways to measure them. Horizontal equity assumes that people with similar needs and abilities should be treated equally; vertical equity assumes that disadvantaged groups should receive a greater share of resources. Based on vertical equity Transportation systems have to provide basic mobility to disadvantage groups and disabled(Litman, 2021).It has been widely accepted that disabled people, have fewer opportunities and lower quality of life than non-disabled. Added with poor accessibility, the disabled people face more challenges and difficulties while travelling and using the public transport. Therefore, it becomes increasingly difficult to ignore the disabled issues while using the facilities of the public transport.(Soltani et al., 2012)

(Kett et al., 2020) did a study on transport and mobility in low and middle-income countries. Their results indicate that transportation issues are a significant concern for people with disabilities. This issue is exacerbated by the challenges in accessibility faced by individuals with disabilities. As much as establishing the group individuals most affected by these limitations remains a challenge.

Disabled people suffer from disabilities including blindness, deafness, and inability to move. Public transportation has to be adapted for using all of these people. Each of these disabilities requires its own adaptation actions(Sobhan Nazari, Fereshteh Faghihinejad, 2012). Blind people need to be able to understand the information of stations and lines of public transportation by signs written in braille. People with an inability to move need to use the elevator to move their wheelchair and also need ramps to enter wagons(Fereshteh Faghihinejad, 2018).

3. Methodology

3.1. Disabled people sample

In order to communicate with the disabled, several active non-governmental organizations (NGOs) (such as the Iranian Association of the Blind, the Association of Spinal Cord Injuries, etc.) were selected, and their subscriber's information was reached. Questionnaires of the physically disabled have been completed through the transportation system for veterans and the disabled. Also, questionnaires of the blind were completed by the blind section of the National Library of Iran.

4. Measure

Before using the questionnaire, it is necessary to create relative confidence in the validity of the questionnaire and its reliability. The tool used to collect the data must be valid in the first instance and reliable in the second instance(Faghihinejad, 2022).

4.1 Evaluating validity of questionnaires

Validity means how much the questionnaires can accurately measure the aim is determined by the research objectives. The opinion of experts and specialists can be an excellent help to improve the validity of measuring instruments. Evaluating the validity is essential because disproportionate measurements can make any scientific research worthless. The questionnaires of this study were designed according to the experiences of prosperous countries in the world and the current needs according to domestic and foreign regulations. Then the necessary changes were applied in consultation with experts, and as a result, sufficient validity was obtained for the questionnaires (Park & Chowdhury, 2018).

4.2 Evaluating reliability of questionnaires

Reliability means does the questionnaires produce the same results under the same conditions (Mehdizadeh et al., 2019). A test is reliable if the test is given several times in a short period to a single group of people, and the results are close. An indicator called the reliability coefficient is used to measure reliability. The reliability coefficient range is from zero to +1. Zero reliability coefficient indicates unreliability, and reliability coefficient 1 indicates complete reliability. "Complete reliability" is really rare, and if it is obtained, you should doubt the results. Different methods are used to calculate the reliability coefficient of questionnaires. One of these methods is Cronbach's alpha coefficient method.

4.2.1 Cronbach's alpha coefficient:

Cronbach's alpha coefficient is used to measure the one-dimensionality of attitudes, beliefs, etc. In other words, it helps evaluate how much the respondents' perceptions of the questions were the same. This coefficient is based on scales. The most common scale used in social research is the Likert scale. The work-based Likert scale is based on the assumption that the items are homogeneous. If the questions are value-based (each question has its own value), Cronbach's alpha is calculated by the following equation.

$$\alpha = \frac{k}{k-1} (1 - \frac{S_i}{S^2})$$

In this relation, k is the number of questions, S_i is the variance of the question i , S^2 is the total variance of the questions. Also, Cronbach's alpha can be calculated by using SPSS software too. The results of Cronbach's alpha indicate the following: (1) the more positive correlation between the questions, the higher the Cronbach's alpha and vice versa, (2) the more significant the mean-variance of the questions, the lower the Cronbach's alpha, (3) Increasing the number of questions will have a positive or negative effect (depending on the correlation between the questions) on Cronbach's alpha, (4) increasing the sample size will reduce the mean-variance of the questions (Hariri-Ardebili et al., 2021), thus increasing Cronbach's alpha. In this study, to evaluate the reliability of the questionnaire, first, a sample of 15 people with physical disabilities and a sample of 10 blind people were selected and asked to complete the questionnaire. Then the Cronbach's alpha of these questionnaires was calculated using SPSS. Based on the obtained results, Cronbach's alpha of the physical disability

questionnaire was equal to 0.709, and Cronbach's alpha of the blind was equal to 0.711. The results showed that the designed questionnaires have sufficient reliability and can be deduced to the results.

5. Statistical Analysis

-Analysis of the results of the physically disabled questionnaire

The results show that out of 141 physically disabled people who completed the questionnaire, 42% were women, and 51% were men. About respondents age, 5% between 51 and 61, 32% between 41 to 51, 42% between 31 to 41, 16% between 11 to 31 and 5% are over 61 years old. In terms of income, 43% of these people were low income.

Regarding the method of transportation in Tehran, the results of the questionnaire showed that 41% of these people use the veterans and the disabled transportation system, 17% use public transportation, 13% move on foot or Wheelchairs, 15% move by service, and 15% use personal vehicles to move.

The traffic hours of the respondents in the city were as follows: 27% between 7-9, 33% between 9-11, 11% between 11-13, 9% between 13-15, 7% between 17-19. Most of the traffic hours for the physically disabled in Tehran are between 7-9 AM. So, to provide exceptional services at the stations of taxis and buses with adapted vehicles, 7-9 AM is the best time. Most of the travel destinations of these people were medical places and universities, and in prioritizing between metro and bus, 43% chose metro and 57% bus.

Regarding the blind people questionnaire distribution, the National Library of Iran (Department of the Blind) was selected, and 70 blind persons filled out the questionnaire. After reviewing the results of questionnaires and entering the information in Excel software, the results showed that 58% of the respondents were male, and 42% of them were female. The age of the respondents was as follows: 23% were between 18-30 years old, 41% were between 30-40 years old, 24% were between 40-50 years old, 7% were between 50-60 years old, and 3% were over 60 years old. In terms of income, 91% of them were low income.

Regarding the way they were transported in Tehran, the following results are obtained: 11% of these people use the transportation veterans and the disabled system for transportation in the city, 23% use public transportation, 34% move by foot, 18% use service, and 14% use relatives' vehicles.

The traffic information of these people is as follows: 31% between 7-9, 38% between 9-11, 12% between 11-13, 8% between 13-15, 9% between 15-17, and 2% between 17-19 were the most frequent hours of blind people traffic in the Tehran city.

Most of the travel destinations of these people were organizations and universities, and in prioritizing between metro and bus, 78% chose metro and 22% bus.

6. Results

6.1 Prioritization of adaptation measures for physically disabled people

Based on the results of questionnaires, the adaption measures to improve access of disabled people are prioritized. Prioritization of adaption measures related to the metro is as follows :

1- installing elevators for entry possibility of the disabled with a wheelchair, 2- Installing a special place for the disabled in each wagon, 3- Short distance with a constant slope between the train entrance and the station level, 4-Installing fixtures to hold the wheelchair, 5- Installing usable health services for the disabled.

Prioritization of adaption measures related to the bus is as follows:

1- Equipment of buses to ramps with low slope or hydraulic lift, 2- equipment one or two places for the disabled with a wheelchair, 3- Installing fixtures to hold the wheelchair, 4- using non-slip materials on the floor of the bus, 5- Assistance of the bus driver, if necessary, to get off and ride the disabled person with a wheelchair, 6- Training of the disabled on how to use the bus.

6.2 Prioritization of adaptation measures for Blind people

Based on the results of questionnaires, the adaption measures to improve access of blind people are prioritized. Prioritization of adaption measures related to the metro is as follows :

1- Installing the raised line on the station floor to guide the blind, 2- Installing raised lines with different materials on the edges of metro stations to warn the blind, 3- Installing spokesman system to announce movement route inside the stations for the blind.

Prioritization of adaption measures related to the bus is as follows:

1- Providing station information in Braille at a specific location of each station, 2- Installing highlight guidelines at bus stops, 3- Installing a speaker system with loud and intelligible expression about station information and unusual events such as diversion or unexpected events within the fleet, 4- Installing station information system, route and sudden changes inside the station, 5- Holding training courses and providing information on how the blind use public transportation.

7. Identify strengths, weaknesses, opportunities and threats to adapt public transport infrastructure and services for disabled people (SWOT matrix analysis)

In this study, first, environmental factors are evaluated in 4 stages. In the first stage, the external factors affecting the public transportation of the disabled in Tehran have been determined, and in the second stage, the importance of these factors, and in the third stage, the ranking of external factors, and in the last stage, the final score is determined.

In order to examine the strengths, weaknesses, opportunities, and threats in providing public transportation services to people with disabilities, the first step is to identify internal and external factors affecting the provision of services and identify existing facilities, users' opinions, and plans for providing these services and the extent of realization of them to identify the strengths and weaknesses of the process of providing public transportation services for disabled people(Fereshteh Faghihinejad, 2013)(Delfani et al., 2021).

According to past studies and interviews with officials and users related to these services, the strengths, weaknesses, opportunities, and threats in providing public transportation services for disabled people

have been identified and presented in Tables 1 and 2. Also, in these tables, each factor's coefficient of importance and the coefficient of effectiveness are specified

Table 1- strengths and weaknesses in providing public transportation services for disabled people

Title	Description of strengths and weaknesses in providing public transportation services for disabled people	importance coefficient	Rank	score
Strengths	Decisions made inside the organization to provide these services	0.12	4	0.48
	Carry out detailed studies to identify the required facilities and estimate them	0.05	3	0.15
	Entering some low-floor buses to bus rapid transit system	0.05	3	0.15
	Providing service in the veterans and the disabled transportation system	0.06	4	0.24
	Lack of integrated management in providing these services	0.05	2	0.1
	Implementation of a few terms and conditions	0.08	1	0.08
	Inadequacy of most sidewalks and public transportation stations	0.06	1	0.06
Weaknesses	Existence of inefficient ramps at BRT stations	0.09	1	0.09
	Lack of construction of elevators on pedestrian bridges of BRT stations	0.08	1	0.08
	Lack of construction of elevators in metro stations	0.13	1	0.13
	Unadapted buses for the use of the disabled	0.08	1	0.08
	Improper design of parking lots for the disabled	0.02	2	0.04
	Failure to hold training courses	0.05	2	0.1
	Lack of systematic supervision and control of approvals	0.08	2	0.16
Total		1		1.94

Table 2- Opportunities and threats in providing public transportation services for disabled people

Title	Description of opportunities and threats in providing public transportation services for disabled people	importancecoefficient	Rank	score
Opportunities	Existence of NGOs and their role in informing and educating the disabled	0.01	4	0.4
	Experiences of other countries in the field of public transportation for the disabled	0.07	4	0.28
	The determination of the municipality and the emphasis of the esteemed mayor of Tehran on the promotion of public transportation services for the disabled	0.08	4	0.23
	Existence of laws related to the adaptation of public transportation for the disabled	0.07	4	0.28
	Existence of experienced managers and experts related to transportation of the disabled and veterans in the municipal body	0.04	3	0.12
	Accession to the Convention on the Protection of Persons with Disabilities	0.06	3	0.18
Threats	Lack of specific budget to adapt the fleet and public transport infrastructure for the disabled	0.1	1	0.1
	Lack of sufficient attention to detailed engineering studies	0.04	2	0.08
	Possibility of disabled people not welcoming public transportation Despite the adaptation	0.08	2	0.16
	Failure to comply with the	0.06	2	0.12

standards designed in engineering studies during execution			
Non-implementation of decisions	0.1	1	0.1
Lack of a specific trustee to adapt the infrastructure and public transport fleet for the disabled	0.06	2	0.12
The long period of compiling, approving, and communicating rules and regulations	0.09	2	0.18
Multiple legal statements without coherence and coordination between relevant units	0.05	2	0.1
Total	1	2.54	

Based on the results of tables 1 and 2, the total final score for the internal factors related to the provision of services in public transportation for the disabled is equal to 1.94. this number indicates that the provision of public transportation services to the disabled is weak in terms of internal factors. Concerning external factors, the total score is 2.54, which shows that in external factors, the system has been able to use the factors that create opportunities to some extent and avoid the factors that cause threats.

IE matrix			The final score of the internal factors evaluation matrix		
			Low	Medium	High
			1-1.99	2-2.99	3-4
external factors evaluation matrix	Low	1-1.99	I	II	III
	Medium	2-2.99	IV	V	VI



Fig 1- IE matrix of the current situation of public transportation for disabled

According to Figure 1, the current state of public transportation for the disabled is located in situation **IV**. Therefore, strategies can be used in these situations that lead to construction and growth. These strategies can include influential factors in focus and integration.

7. Conclusion

This study was conducted to investigate the status of public transportation for disabled. This evaluation has been done in Tehran. The questionnaires of this study are designed for the physically disabled and the blind. By using these questionnaires, the disabled people have been asked to prioritize the importance of measures listed in the questionnaire. These measures need to be taken to make public transportation suitable for disabled people. Questionnaires were evaluated using Cronbach's alpha in SPSS software. Based on the obtained results, Cronbach's alpha of the physical disability questionnaire was equal to 0.709, and Cronbach's alpha of the blind was equal to 0.711. 384 questionnaires were provided to the disabled. The disabled were asked through the veterans and disabled system, and the blind through the National Library blind section. Using these questionnaires, adaptation cases were prioritized in terms of importance. These people's most frequent travel hours, routes, and busy destinations were also identified. It helps to identify the stations that are prioritized for adaptation. It is also possible to provide adapted vans for their transport in these stations during the hours when these people have the most movement. Using the SWOT analysis and examining the strengths and weaknesses, opportunities and threats, and the IE matrix, the current public transport status of the disabled was examined, and its location is in situation IV, which means that it needs to develop and build strategies.

8. References

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