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Investigating and analyzing women's sociocultural barriers in using the public transport system in Ahvaz metropolis

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Abstract

The present study aimed to investigate and analyze women's sociocultural barriers in using public transport of Ahvaz Metropolis. This research is applied-theoretical in terms of purpose and descriptive-analytical in terms of method. The data were collected through library studies, surveys, and interviews with citizens and experts of public transport. The ARAS decision-making method was used to rank the barriers. For zoning the barriers in Ahvaz, the interpolation kriging model in ARCGIS 10.3 software was employed. The results show that the sociocultural barriers of each age group of women are different in each public transport mode. Ranking these barriers shows that sexism looks, men's sexual looks, relatives, families, disapproval, and the drivers' nonsense talk, respectively, are the major barriers to bus and taxi use, walking, and cycling. In addition, zoning the barriers indicated that the further one moves from north to south of the city, the greater the barriers are. A regional view of this zoning confirms that about 90% of the area of districts 4 and 8 are in the high and very high range, and 30% of district 3 is in the high range. These districts are less favourable than other districts of Ahvaz, but zone 2 is the most favourable one, as it is entirely in low and very low ranges.



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1. INTRODUCTION

Spatial equity in complex spaces such as metropolitan areas is a very interesting subject for research, particularly in view of its enormous potential public policy applicability. An approach to the subject based on the population's access to essential public services (education, health care and social services) is proposed (Pitarch Garrido, 2013; Bartzokas-Tsiompras & Photis, 2019).

Transport and mobility are intertwined with people's daily activities of (Joelsson et al., 2019; Bartzokas-Tsiompras, et al. 2019;2020a;2020b;2021; Bartzokas-Tsiompras & Photis, 2017). It is a system enabling citizens to move to their favorite places by providing access to essential activities (Levy, 2019). In other words, transport can be defined as the nodes through which people move from one place to another. If it is public, it is considered a key element in low-cost transportation (Lois Monzón, and Hernández, 2018). In this respect, this transport mode is a fundamental strategy for achieving sustainable transport development. The paradigm of sustainable mobility has been the focus of urban transport researchers for more than a decade. This paradigm focuses on the environmental impacts of trips which is effective on preventing climate change (McArthur et al, 2019). However, different layers of society, especially urban women, face many barriers when using it. In many countries, urban spaces have become gendered in nature, imposing restrictions on women's freedom of action. This dilemma not only deprives women of their natural rights to enjoy cities' public spaces, but also avoids their participation in social activities.

While urbanization is often seen as a phenomenon of expanding women's social and political opportunities as well as an opportunity for their independent mobility (Chant and Datu, 2015), in underdeveloped countries many women feel anxious about using public transport because of security concerns (Song et al, 2018). Given women's repeated use of the public transport system daily, some believe that women's average daily trips are sometimes three times higher than men's. In this regard, it is necessary to create transport systems that meet the women's transport needs, although this phenomenon does not significantly reduce the burden of injuries caused by women's problems in urban trips (Seyedi, 2018). In some countries, numerous advances have been made to identify factors affecting women's safety and security. Identifying these factors is crucial because women are most at risk and subject to various types of harassment, so they are identified as a cautious group. In this regard, Hunlon claims that their access to public resources such as transportation is crucial, especially for those living in urban areas, since much of the urban women community is dependent on public transport (Sham et al, 2018). Other than infrastructural, economic, management, and land use problems, women of different cities in Iran face numerous sociocultural barriers. Ahwaz metropolis is no exception. One of the major problems facing women in Ahwaz metrologies is urban transportation services, which neglects the women's needs of city traffic. This issue is linked to their multiple family and social roles. Ahwaz's urban transport services and services are organized in a way that responds mainly to men's needs. Although most women are lower-paid than men, they men use public transport for their multiple social roles more often than. However, the presence of sociocultural barriers has led to a decrease in their willingness to use this green and invaluable mode of transport. These barriers can be seen in the different types of Ahwaz urban transportation. Therefore, in order to create balance and equality between men and women, promote women's citizenship, prevent

and eliminate social harm to women, achieve a woman-friendly city, and ultimately achieve comfort as one of the important goals of urban planning, explaining and analyzing women's sociocultural barriers to using public transport seems necessary. Moreover, according to the second five-year development plan of Ahvaz metropolis transportation and trips (2018-2022), one of the most important strategies for developing public transportation in Ahvaz is identifying transportation barriers in its various dimensions. This doubles the necessity of doing the present research. One of the groups of these barriers is sociocultural barriers. Due to their wide spread in different segments of society and different modes of transportation, the main purpose of this research is to investigate and analyze the women's sociocultural barriers to using public transportation in Ahvaz metropolis. Moreover, the ranking of barriers in each mode of public transportation and their zoning are the operational objectives of the present study. To this end, the study makes attempts to answer the following question: what are the women's sociocultural barriers to using in public transport in Ahvaz? To answer this question, this study first seeks to analyze and explain these barriers, then identify the coefficient of significance of each of these barriers in the four modes of public transport in Ahvaz, and finally find out how these barriers in the city are determined using zoning maps.

2. BACKGROUND

2.1 literature Review

The following is a review of works done on women's use of the transportation system in Iranian context and other countries (Table 1).

Table 1. Research on women's use of the transportation system in Iran and other countries

Researchers	Year	Title	Results
Buzarkhomari, Abdollahi, and Torkaman Nia	2011	Women, security and urban transport	Using a library research approach, this study explained the barriers and limitations of women's active presence in urban spaces. Research findings suggest that Iran ranks 118 out of 128 countries in terms of gender gap, one of which is the lack of fair use of public spaces. The results shows that men use more urban spaces more than women because of more security they feel, while women are the most frequent users of public transport.
Ziari and Torkaman Nia	2013	The degree of women's enjoyment from the intercity transport system (Case study: District 6 of Tehran)	The results showed that 59% of women have an inner-city trips every day. In addition, 59% of them do all of their inner-city trip by public transport. 60% of women preferred buses, and 24% taxis. Also, 96% of women hours before darkness for their trips. Their peak daily trips are at noon. They also referred to their use of public transport at the end hours of a day because of insecurity.
Riahi Khachaki	2016	Social Analysis of the Factors Affecting the Street Harassment of Women and Girls (Case Study: Female Students of Mazandaran University)	In this research, feminist theories, gender socialization and social learning theories were employed. The findings indicate that only 2.6 % of participants have never been harassed over the past year. Overall, 70.6 % of participants have been harassed several times a day. The analytical results also show that acceptance of

Researchers	Year	Title	Results
			stereotypes of gender roles has a negative effect on the level of harassment, but the acceptance of patriarchal values and social learning are not effective on the level of harassment.
Bushati and Galvani	2017	Images of Gender Among Western and Eastern Perspective: The Case of Bahrain	Governmental and Inter-governmental organizations are launching programs and laws in order to gain equality and parity between both sexes in every condition of life, since assuring human rights is a prerequisite of human development and development in general. In addition, achieving gender equality and empowering all women and girls is essential for achieving sustainable development, one of the post-2015 sustainable development goals.
Mir Moghtadaei and Adli	2018	Urban development based on public transportation and women's safety	The results of this study indicated that the majority of women are reluctant to walk or trip with metros. They also prefer to have urban trips in daytime and congested routes.
Riggs and Schwartz	2018	The impact of cargo bikes on the travel patterns of women	The results showed that 78% of women use bicycles for urban trips, while 56% of men use bikes for their urban trips. Results also revealed that cycling depend on factors such as accessibility, geographic location, and experience of using bicycles.
Song, Kirschen, and John	2018	Women on wheels: Gender and cycling in Solo, Indonesia	This article examined how cycling is promoted among women. It also investigated the barriers to mobility, access, and urban areas. The results showed that a combination of gender, geographical location, attitudes, and behaviors of women in low-income communities, as well as access to public transport network are effective on the development of bike-friendly cities. Based on the analytical findings of this comparison, it suggested alternative policies to promote cycling in a more appropriate way.
Joelsson, Christinaaauthor, and Lind	2019	Towards a Feminist Transport and Mobility Future	This research discussed the significance of combining useful methods and times that emphasize issues of power equality, gender equality, knowledge equity, and epistemology of transportation plans.

3. MATERIALS AND METHODS

The present study employed an applied-theoretical and descriptive-analytical research method. The data were collected through documentary, library, survey, and interviewing techniques (Table 2).

Table 2. Women's sociocultural barriers to using public transport

Mode of transport	Row	Sociocultural items	Resources
Walking	Da ₁	Taunting	(Riahi and Khachaki, 2016)
	Da ₂	Theft	Field studies (interviewing)
	Da ₃	Chasing	Field studies (interviewing)

Mode of transport	Row	Sociocultural items	Resources
	Da ₄	Sexism look	(Johnson, 2017)
	Da ₅	Inappropriate beeps	(Riahi and Khachaki, 2016)
	Da ₆	Accumulation of evil individuals	(Zali, et al, 2015)
	Da ₇	Jostling	Sadeghi and Ziaei Nikdel, 2015)
	Da ₈	Whistling	(Riahi and Khachaki, 2016)
	Da ₉	Inappropriate gestures	(Jehangir Bharucha, 2018)
	Da ₁₀	Noisily swerving and braking with cars	(Riahi and Khachaki, 2016)
	Da ₁₁	Asking women's phone numbers	Field studies (interviewing)
	Da ₁₂	Aggressive factors	(Riahi and Khachaki, 2016)
Bus use	Db ₁	Weakness in claiming something	Field studies (observation)
	Db ₂	Spatial inequality	(Sunet al, 2018)
	Db ₃	Non-assignment of seats to pregnant women	(Sayyedi, 2018)
	Db ₄	Problems with freight	Field studies (interviewing)
	Db ₅	Men's sexual looks	Field studies (interviewing)
	Db ₆	Drivers' inappropriate behaviors	(Luiu, 2018)
Cycling	Dc ₁	Sexism look	Field studies (interviewing)
	Dc ₂	No commonness of cycling among women	Field studies (observation)
	Dc ₃	Mocking and scoffing	Field studies (interviewing)
	Dc ₄	Relatives'/families' disapproval	Field studies (interviewing)
	Dc ₅	Social unacceptance	(Asgari and Rahimi, 2017)
	Dc ₆	Social norms	(Sorour and Amini, 2013)
Taxi use	Dd ₁	No observation of appropriate distance	Field studies (interviewing)
	Dd ₂	No assignment of front seat	(Jamali and Shayegan, 2011)
	Dd ₃	Setting the mirror to the women's faces	Field studies (observation)
	Dd ₄	Drivers' touch of women's hands when they are paying taxi fares	Field studies (interviewing)
	Dd ₅	Drivers' pointless conversations	Field studies (interviewing)
	Dd ₆	Other travelers' sexism look	Field studies (interviewing)

The research statistical population consisted of women living in eight districts of Ahvaz metropolis. From among the population, 384 individuals were selected as the sample via the Cochran formula. This number increased to 400 individuals for higher validity and reliability. These participants were selected via proportionate stratified random sampling method, so that proportion to the population of each district, a percentage of total statistical samples was assigned to that district (Table 3).

Table 3. Population of districts of Ahvaz and the number questionnaire copies distributed among these districts

District:	01	02	03	04	05	06	07	08	Total
Total population	7002 8	5348 8	8831 7	7721 8	5245 9	8209 9	6958 0	9482 5	5880 14

% of population	11.90 9	9.09 6	15.01 9	13.13 2	8.92 1	13.9 62	11.83 3	16.12 6	100
Sample size	48	36	60	53	36	56	47	64	400

Source: (Ahvaz Municipality, 2018; and research findings 2019)

In order to rank sociocultural barriers in each of the different modes of transportation, an expert questionnaire was designed. The snowball sampling technique was used to determine the number of experts. Accordingly, 15 experts in the field of transportation were selected. The study used quantitative models for analysis. ARAS decision making was employed to rank the barriers in different public transport modes. This technique consists of 5 steps as follows (Kututa, 2013):

Step 1: Formulating the decision matrix obtained from equation (1): in this equation, the decision matrix is represented by x and each of its drives by x_{ij} .

$$x = \begin{bmatrix} x_{i1} & x_{i2} & \dots & x_{iN} \\ x_{12} & x_{12} & \dots & x_{iN} \\ \dots & \dots & \dots & \dots \\ x_{m1} & x_{m2} & \dots & x_{m3} \end{bmatrix} \quad (1)$$

The second step is descaling the matrix obtained from equation (2). In this method, the descaling is done by the linear method, descaling is represented by n and each entry by n_{ij} .

$$n_{ij} = \frac{x_{ij}}{\sum x_{ij}} \quad (2)$$

Step 3 is normalization of the decision matrix obtained from equation (3). In this step, the descaled matrix is transformed into the weighted decision matrix (v). In this study, using the ANP technique, weights of indices were obtained and finally multiplied by descaled weights.

$$v = n \times w_{ij} v_{ij} = N_{ij} = N_{ij} \times w_j$$

$$v = \begin{bmatrix} v_{i1} & v_{i2} & \dots & v_{in} \\ v_{12} & v_{12} & \dots & v_{in} \\ \dots & \dots & \dots & \dots \\ v_{m1} & v_{m2} & \dots & v_{mn} \end{bmatrix} \quad (3)$$

Step 4 is calculation of the optimal value and the degree of utility or utility of the options obtained from equation (4) where the best option is to have the best S_i . Finally, the degree of utility must be calculated. The degree of utility of option A_1 is calculated by comparing S_i with an optimal value. According to the experts, the optimal value of s is the best option and the degree of utility of the A_i option is shown with K_i and obtained from equation (5).

$$S_i = \sum_{j=1}^n v_{ij} \quad (4)$$

$$k_j = \frac{S_i}{S_0} \quad (5)$$

Also, for the zoning of these barriers in Ahvaz, Kriging interpolation method was employed in ARCGIS 10.3 software. The calculation of this model is done via equation (6).

$$\hat{z}(S_0) = \sum_{i=1}^n \lambda_i z(S_i) \quad (6)$$

Where $z(S_i)$ is the measured value in the i th position and λ_i is the weight of the measured value in the i th position. S_0 is the predicted position and n is the number of measured or known points. After interpolating all the barriers using the Reclassify tool, which is a subset of Spatial Analyst Tools in the Arc Toolbox, the maps were plotted in five points (very low, low, medium, high and very high) and finally maps were overlaid using the Weighted Sum function.

4. ANALYSIS

In this study, 30 items were analyzed in four public transport modes in Ahvaz. These barriers were categorized as sociocultural barriers to walking (12 factors), taxi transport (6 factors), bus transport (6 factors), and cycling (6 factors). In the following paragraphs, how these barriers affect public transport is investigated.

Cycling culture, as one of the ways to achieve green transportation, still has no place in underdeveloped countries, especially among Iranian women. Although there is no prohibition on women's cycling in civil law, but there are social and cultural issues. That has prevented women from using bicycles. Women are less likely to use bicycles because of the lack of cycling culture, lack of proper cycling paths, uncommonness of cycling in Iranian society, inappropriateness of cycling, humiliating views on cyclers, and relatives'/families' disapproval.

In metropolis like Ahvaz, where some of the streets are crowded with evil people, women face numerous barriers while walking. These types of harassment range from beeping to verbal and non-verbal sexual harassments. Strangers' harassments include both verbal and nonverbal behaviors. In Ahvaz, there are many women who are victims of street harassments or abuses. Verbal and physical harassments, braking, car-swerving, rubbing, jerking, whistling, inappropriate gestures, and asking for girls' and asking women's phone numbers are examples of women's barriers to walking. According to interviewees, most victims of these harassments escape or relocate to get out of the harasser's access or at least not to hear their voices quickly as possible. There are few women who protest or raise their voices when facing street harassments. Among the most common street harassments is taunting girls and women. Taunting can be abusive, may be a misconception or much worse mockery, sexual description of women's appearance. However, girls need to be taunted because of their features. According to interviews with four women, the authors found that women were exposed to inappropriate and annoying words while walking. Outside the age range, clothing, height, age, job type, marital status, etc., most women were confronted by taunting. Walking women said that they were accustomed to it. Others stated that they were abused. As long as the sidewalks are

filled with such sentences, one cannot expect women to walk comfortably without stress. This causes women to use a personal car for daily activities, even on short trips. Such barriers are usually not palpable that we can eliminate or change in the short term. These issues are rooted in culture of using public places. This is the issue that solves only with education; urbanism education that defines the urban lifestyles is the only way to save ourselves from such problems.

Research shows that women travel by bus more often than men. However, there are numerous sociocultural barriers that reduce the tendency of women of Ahvaz to use buses. Gender segregation due to delayed arrival and getting off is one of the social barriers to the development of public transport in Iran because not only getting on and off of the buses waste passengers' time, but also leads to increase traffics in the main passages, as there is no special bus routes in Ahvaz and buses use routes common for all other vehicles. Alongside gender segregation, there is also a spatial inequality in buses relative to women's status. This low space creates more problems especially for pregnant women because they need to sit on seats due to their physical conditions, but these seats may be saturated by other younger and non-pregnant women who, if they do not wish to give up their seats, the sociocultural barrier becomes more visible. Another barrier reducing women's acceptance of public transport is the difficulty with carrying stuff and supplies. Women who want to shop, especially in the city's commercial centers, find it difficult to travel in this way, given the low bus space and the amount of stuff they have. In addition to drivers' perceived malice and inappropriate behaviors, these are women's sociocultural barriers to use the buses in Ahvaz.

Another mode of public transport in Ahvaz that deals with transportation of citizens and stuff is taxi driving. In this mode of transport, there are numerous sociocultural barriers. It has been observed that in taxis when a woman is seated in the back seat and a male passenger is seated next to her, the male passenger may not observe the distance and have a sexual look at the woman. So she is forced to stick herself to the taxi door for shame and prudence until she will reach her destination. These men's behaviors engender insecurity for women traveling alone in the city. At this point, when there is only one woman sitting in a cab based on the values in Iran, the logic is to give the front seat to the woman, but some people are reluctant to give the front seat to the women. This is another cultural barrier to be investigated. Other sociocultural barriers to using taxis are setting the taxi mirror towards women's faces. This factor, besides starting pointless conversations with women, make taxis insecure for women. Another women's barrier to using public transport may be drivers' touch of women's hands when they are paying taxi fares.

After explaining these barriers and understanding how they affect public transport, we now need to analyze them in the study area. To this end, questionnaires were distributed among 400 women living in eight districts of Ahvaz (Fig. 1).

As shown in (Fig. 1), 69% of the participants are married. In terms of age, 50% of them were 16 to 25 years old. Moreover, a low percentage of them were women aged 56 years and above, accounting for 3% of the sample. In terms of employment, 47% of them were students, and only 4% were self-employed. In terms of education, the lowest percentage of participants held elementary education (6%), and the highest percentage of them held in bachelor's degree (47%). This difference is also seen in the way public transport is used.

Of the four current public transport modes, 47% of the sample used buses, 2% bicycles, 42% taxis, and 9% walking.

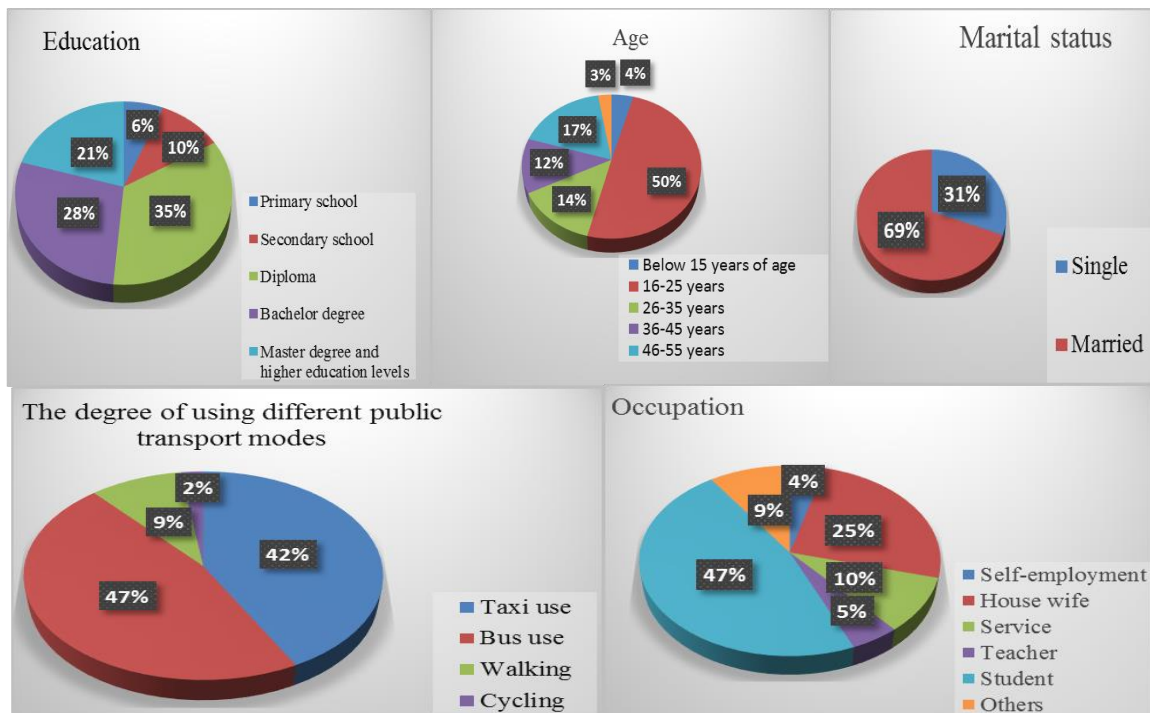


Figure 1. women's demographic characteristics and their degree of use of four public transport modes
Source: (research findings, 2019)

Since public transport in Ahvaz has four modes of bus driving, taxi driving, walking, and cycling, and the barriers vary in each age group of women and in their mode of transport (group or individual modes), there is a need to investigate the sociocultural barriers in the four modes in order to prioritize the effectiveness of each public transport mode and determine which sociocultural barriers in which age group prevail in each of public transport mode. The significance of this prioritization is that because urban organizations are not able to address these barriers altogether, cross-sectional elimination of these barriers is adopted. So, we prioritize these barriers in terms of effectiveness. To prioritize these barriers, the ARAS model is used, the results of which are shown in Table (4) and its effects on age groups is displayed in in (Fig. 2).

Table 4. Final results of the ARAS mode

Items	Age group						Mode of transport		Total utility	Final weight
	Under 15	16-25	26-35	36-45	46-55	Above 56	group	Individual		
Weight of criteria	0.385	0.865	0.798	0.668	0.436	0.265	0.236	0.365		
Hypothetical ideal	0.0027	0.0360	0.0322	0.0271	0.0238	0.001	0.0121	0.0190	0.1541	
Da ₁	0.0122	0.0360	0.0280	0.0260	0.0134	0.0012	0.0089	0.0190	0.1445	0.9334
Da ₂	0.0292	0.0287	0.0309	0.0268	0.0236	0.0036	0.0090	0.0189	0.1707	0.1030
Da ₃	0.0122	0.0329	0.0323	0.0218	0.0098	0.0203	0.0090	0.0153	0.1535	0.9921
Da ₄	0.0100	0.0359	0.0307	0.0237	0.0101	0.0049	0.0109	0.0194	0.1455	0.9404
Da ₅	0.0174	0.0324	0.0309	0.0223	0.0129	0.0020	0.0080	0.0082	0.1340	0.8658
Da ₆	0.0098	0.0124	0.0094	0.0124	0.0066	0.0073	0.0056	0.0131	0.0766	0.4952
Da ₇	0.0174	0.0351	0.0309	0.0274	0.0162	0.0053	0.0057	0.0130	0.1510	0.9755
Da ₈	0.0174	0.0329	0.0292	0.0223	0.0161	0.0091	0.0046	0.0044	0.1360	0.8788
Da ₉	0.0086	0.0329	0.0267	0.0261	0.0200	0.0069	0.0080	0.0077	0.1367	0.8830
Da ₁₀	0.0261	0.0283	0.0270	0.0235	0.0145	0.0135	0.0072	0.0082	0.1482	0.9578
Da ₁₁	0.0100	0.0347	0.0302	0.0102	0.0000	0.0140	0.0080	0.0118	0.1189	0.7684
Da ₁₂	0.0269	0.0141	0.0253	0.0234	0.0183	0.0000	0.0080	0.0056	0.1215	0.7853
Db ₁	0.0074	0.0090	0.0085	0.0075	0.0061	0.0118	0.0034	0.0049	0.0586	0.3784
Db ₂	0.0122	0.0360	0.0280	0.0260	0.0134	0.0055	0.0080	0.0190	0.1479	0.9558
Db ₃	0.0292	0.0287	0.0309	0.0268	0.0236	0.0036	0.0090	0.0189	0.1707	1.1030
Db ₄	0.0122	0.0329	0.0323	0.0201	0.0098	0.0203	0.0090	0.0153	0.1519	0.9813
Db ₅	0.0100	0.0359	0.0307	0.0274	0.0146	0.0049	0.0109	0.0194	0.1538	0.9936
Db ₆	0.0174	0.0324	0.0309	0.0223	0.0129	0.0014	0.0080	0.0082	0.1334	0.8621
Dc ₁	0.0098	0.0124	0.0094	0.0124	0.0066	0.0073	0.0056	0.0131	0.0766	0.4952
Dc ₂	0.0174	0.0351	0.0309	0.0274	0.0162	0.0053	0.0057	0.0130	0.1510	0.9755
Dc ₃	0.0074	0.0193	0.0264	0.0262	0.0225	0.0091	0.0105	0.0115	0.1329	0.8587
Dc ₄	0.0017	0.0181	0.0208	0.0218	0.0190	0.0219	0.0000	0.0000	0.1033	0.6675
Dc ₅	0.0027	0.0117	0.0142	0.0198	0.0190	0.0175	0.0034	0.0176	0.01061	0.6858
Dc ₆	0.0101	0.0178	0.0181	0.0224	0.0224	0.0215	0.0105	0.0107	0.1335	0.8623
Dd ₁	0.0007	0.0359	0.0302	0.0237	0.0132	0.0220	0.0004	0.0000	0.1259	0.8135
Dd ₂	0.0074	0.0090	0.0085	0.0075	0.0061	0.0063	0.0034	0.0049	0.0531	0.3428
Dd ₃	0.0091	0.0353	0.0306	0.0174	0.0129	0.0055	0.0114	0.0113	0.1335	0.8627
Dd ₄	0.0091	0.0347	0.0266	0.0223	0.0132	0.0075	0.0079	0.0066	0.1279	0.8266
Dd ₅	0.0194	0.0359	0.0309	0.0239	0.0120	0.0016	0.0122	0.0153	0.1513	0.9773
Dd ₆	0.0024	0.0329	0.0264	0.0199	0.0070	0.0030	0.0120	0.0116	0.1150	0.7431

Source: (authors' findings, 2019)

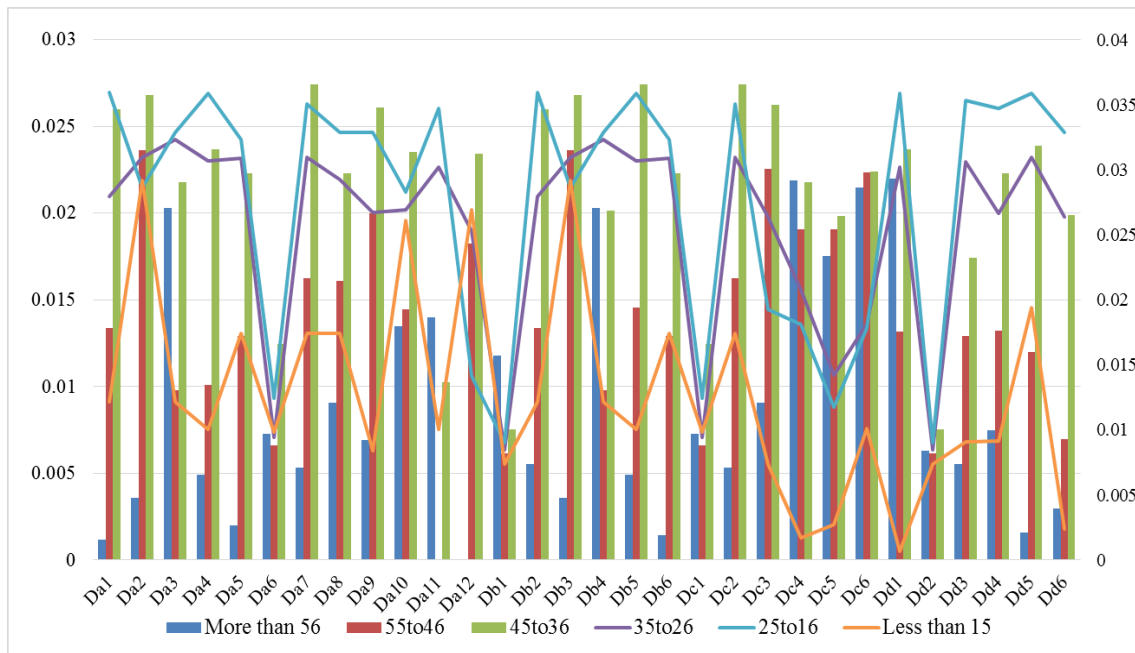


Figure 2. Effects of sociocultural barriers on the use of public transport in terms of age groups

Source: (authors' findings, 2019)

As illustrated in (Fig. 2), for women aged under 15 years, Da2 is the most effective sociocultural barrier on walking, but it is the least effective barrier for women 56 years and above. For women aged 16 to 25 years, the most effective sociocultural barriers are taunting (Da1) and sexism look (Da4). This difference is also evident for women aged 26 to 35, with women of this age group being the most likely to be chased (Da3). But for women aged 36 to 45, deliberate jogs by evil people (Da6) have the most and least effects on walking, respectively.

In the women aged 45 to 56 years, evil people's aggregation (Da6) is the least effective barrier to women's walking. Analysis of women's sociocultural barriers to bus use shows that the most effective barriers are men's sexual views (Db1), problems with carrying supplies and stuff (Db5), inappropriate drivers' behaviors (Db6), and space inequality (Db1) in the age groups below 15 years, 16 to 25 years, 26 to 35 years, 36 to 45 years, 46 to 55 years and 56 years and above, respectively. Analyzing women's sociocultural barriers to cycling also shows that for women aged 56 years and above, ridicule (Dc3); for women 46 to 55 years, social disapproval (Dc5) and sexism look (Dc1) were the least and the most effective barriers. Also ridicule (Dc3) was found to be the most effective barrier for women aged 36 to 45 years. Women of Ahvaz, aged 26 to 35 years, also believe that sexism look (Dc1) and social considerations (Dc6) have the most and least effective sociocultural barriers, respectively. In this regard, sexism look (Dc1) is the most important obstacle for women under 16 who are most likely to use bicycles. There is a difference in the ranking of sociocultural barriers to taxi use by age in the territory under study, such that, according to this mode of transport, from small to large, non-transfer of front seats (Dd2) is the same for all; But the gendered looks factor by other travelers (Dd6) is more for women aged 16 to 25 years than other age groups. Drivers' touch of women's hands when they are paying fares (Dd4) is more for women aged 16 to 25 than those aged 36-

45 years. Assignment of front seat to women (Dd2) is the same for women aged 36 to 45 and 26 to 35 years. Ultimately, no observation of distance (Dd1) is lower for women aged 15 years and below.

These barriers are also different in terms of women traveling individually or in groups. This difference is illustrated in (Fig. 3), showing that sexism looks (Da4), men's sexual looks (Db5), relatives'/families' disapproval (Dc4), and drivers' pointless conversations (Dd5) are the most effective barriers to walking, bus use, cycling and taxi use, respectively.

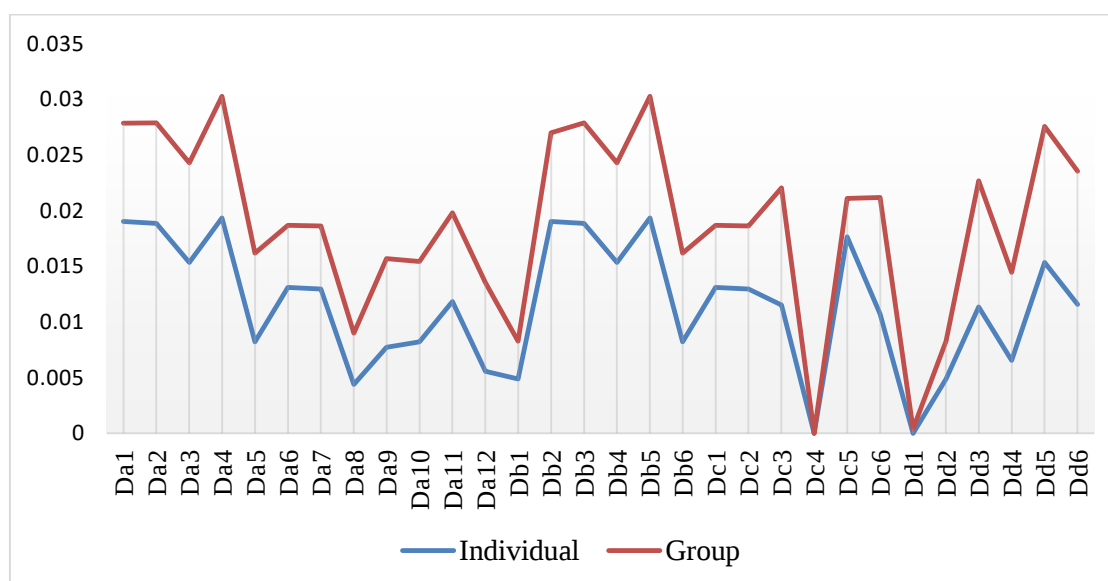


Figure 3. Ranking of women's sociocultural barriers to using public transport in terms of individual and group trips

Source:(authors' findings, 2019)

After analyzing the sociocultural barriers of women in terms of age groups and individual or group trip patterns, these barriers need to be ranked in order to determine what barriers women in Ahwaz face when using four modes of public transportation. Fig. 4 illustrates these barriers.

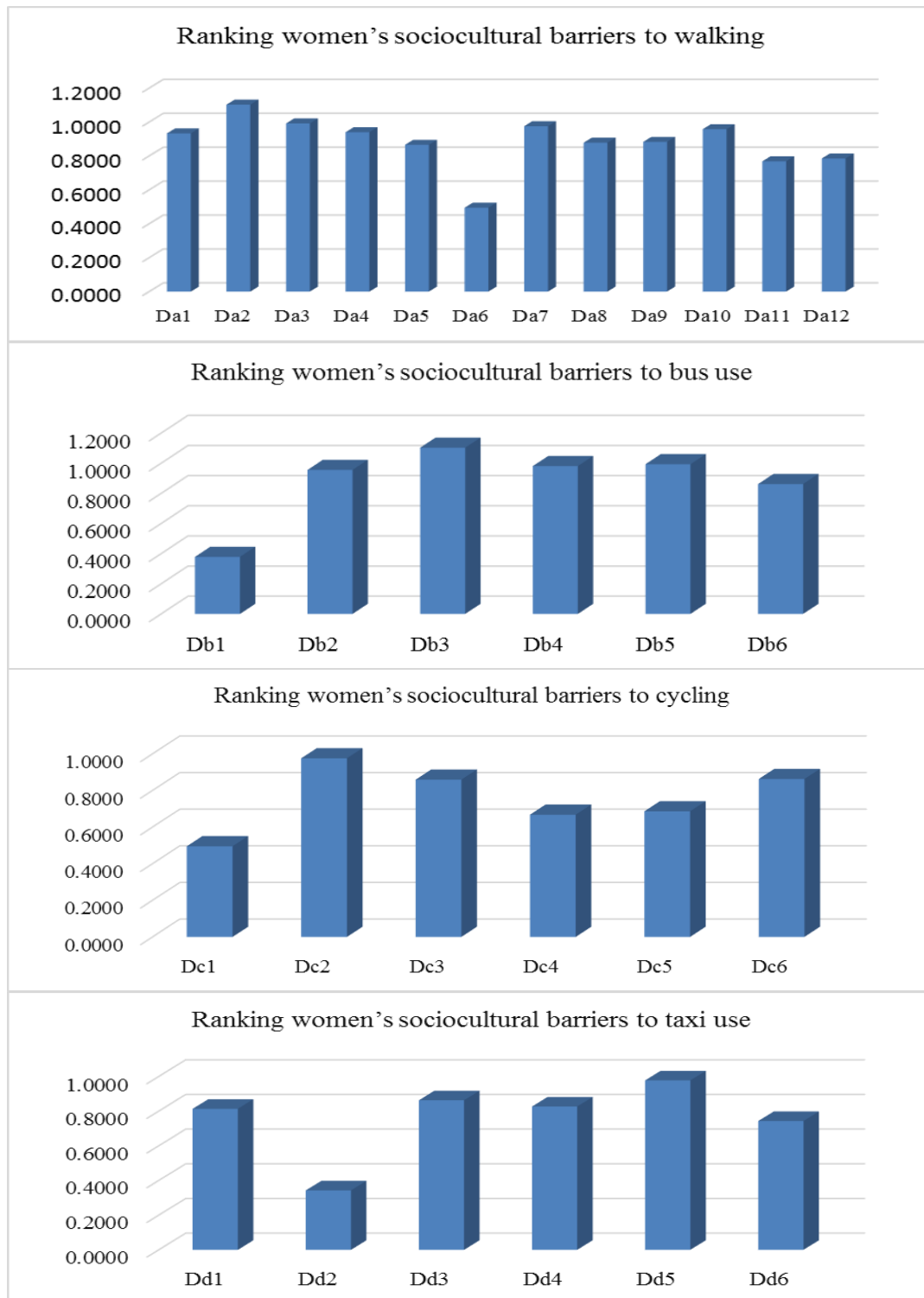


Figure 4. Ranking women's sociocultural barriers to using four public transport modes in Ahvaz

Source: (authors' findings, 2019)

After ranking women's sociocultural barriers in each of the public transport modes, their spatial differences should now be identified. To this end, zoning is needed. The Kriging interpolation method is used for zoning. This model's inputs are both raw data that are the citizens' views, and certain points in the city. After collecting the necessary data, it is now necessary to identify the geographical analysis of each of the women's sociocultural

barriers to using the public transport modes in Ahvaz. Fig. 5 illustrates the overlay of the barriers to using the four public transport modes.

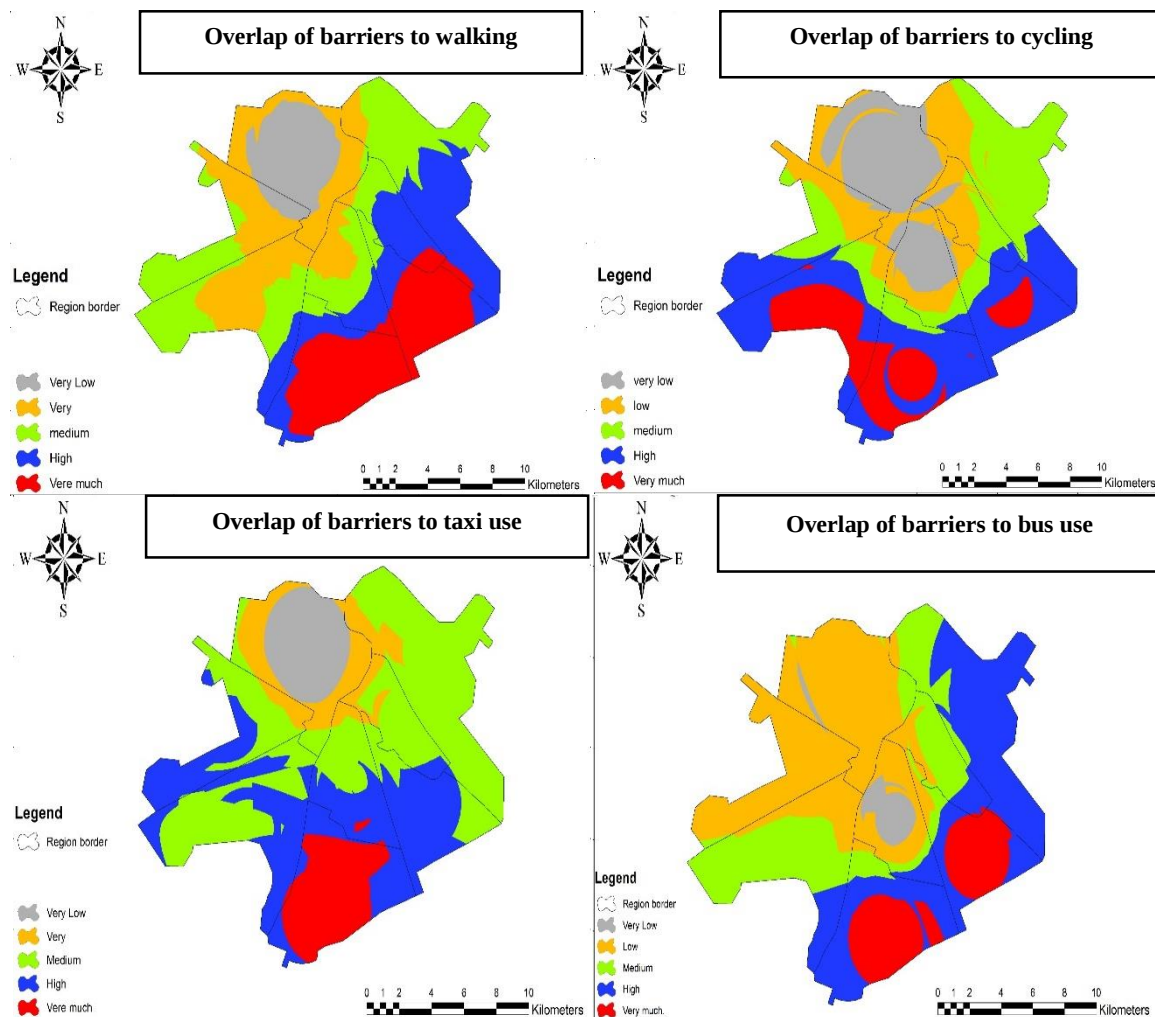


Figure 5. Overlay of women's sociocultural barriers in each of the four public transport modes in Ahvaz

Source: (authors' findings, 2019)

As illustrated in Fig. 5, the spatial differences of women's sociocultural barriers to using public transport in Ahvaz differ in the use of public transport modes. The overlay of women's sociocultural barriers during cycling indicates that the largest area of districts 1 and 2 is in the low range. But the largest area of district 3 is in the middle range. Also the southern areas of the city, such as districts 4, 6 and 8 are in the high and very high ranges. In other words, women sociocultural barriers to cycling in Ahvaz are such that the further one moves from south to north, the greater these barriers are.

Zoning women's sociocultural barriers to walking also shows that the further one moves from north to south and from east to west, these lower these barriers are. Regional analysis of these factors shows that district 4 is the most unfavorable range because over 90% of its area is in the high and very high ranges. District 2 is the most favorable because all its area is in the low and very low ranges. But, four low, medium, high, and very high ranges uniformly cover the area of the district 1. In addition, the overlay of

women's sociocultural barriers to bus use across Ahvaz is different, as the city's widest area is in the high range. This range is higher as one moves from south to north and west to east. A more detailed analysis of this determines that districts 4 and 8 are the least favorable and 3 are the most favorable zones.

This spatial difference in barriers to taxi use is also evident in the study area, as the highest urban area being in the middle range, the southern and western parts of the city being in the high and very high ranges. It covers the most barriers in the southernmost areas of city, i.e. district 4. District 2 is only less than 10% in the medium range, but more than 90 % of it in the very high range. After measuring the sociocultural barriers to the four public transport modes, it is now necessary to overlay all barriers to draw the final map of women's sociocultural barriers to using public transport (Fig. 6).

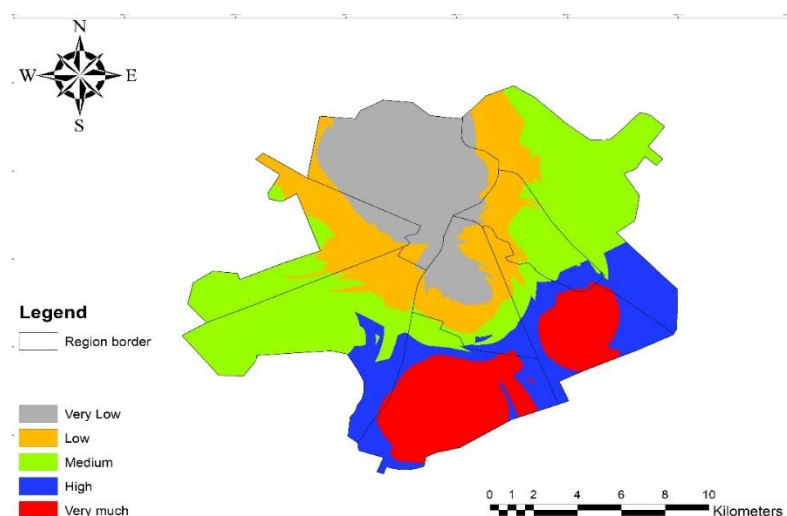


Figure 6. Final overlay of women's sociocultural barriers to using public transport in Ahvaz

Source: (authors' findings, 2019)

As illustrated in fig. 6, most of the city's area is in the medium range and the lowest area is in the very high range. In other words, the more one moves from north to south, the greater the barriers are. A regional view of this map reveals that about 90% of districts 4 and 8 are in the high and very high ranges, and 30% of district 3 is in the high range. These areas are less favorable than other districts of Ahvaz, but district 2 is the most favorable zone because its entire area is in the low and very low ranges.

5. CONCLUSIONS

This study is in line with other related researches, in which Buzmarghari et al. (2011) examined the safety of women in urban transport and confirmed that the sex gap of Iranian suburban traffic among 128 countries is at the 118th rank. In fact, they have compared the transportation situation of Iranian women with other countries, but this study identified the women's sociocultural barriers to using public transport in Ahvaz. The similarity of these two studies is that both have moved towards the women's security in using public transport.

Ziyari and Torkamannia (2013) studied the degree of women's enjoyment of intercity transport in District 6 of Tehran. The similarity of their study with the present study is that both studies determine the extent of women's use of public transport. But what distinguishes them is that the present study ranked women's barriers in the four public transport modes in Ahvaz. Riahi Khachaki (2016) analyzed the social barriers affecting the street harassment of female students of Mazandaran University. It has similarities with the present study in terms of women's barriers to walking, but indices such as asking women's phone numbers, robbery, chase, and evil people's aggregation have distinguished the research. In addition, it has prioritized women's sociocultural barriers to walking.

Mir Moghtadaei and Adli (2018) pointed to women's security in public transport based development. Their results are consistent with those of the present research in terms of public transport development, but the difference between their results and those of the present study is that the present study zoned the investigated indices in the city. In other words, recognizing spatial differences is a distinctive feature of the present study. Heidari Sourshajani (2018) explained the women's satisfaction with public transport of Kashan City, with more emphasis on the physical issues of public transport, but indices such as the drivers' behaviors make the results of the present research consistent with those of Heidari Sourshajani. But its difference with the present study is that the present study explores women's sociocultural barriers, then identifies them in a city, and finally prioritized them in each public transport mode. The similarity of the present study with the of the elderly women's conditions in using public transport in West Bengal, India (Bhattacharya, 2018) is that both studies considers women's ages. Investigation of criteria such as behavior of side travelers' and drivers' behaviors in the present study are consistent with the indices investigated in Bhattacharya (2018). However, the difference of this research is ranking women's sociocultural barriers in each public transport mode.

Dorantes (2018) explored Mexican working women's perspective on transportation policies, pointing to inefficiencies in transportation, and the income gap between women using public transportation. The present study, on the other hand, addressed women's sociocultural barriers to different public transport modes in Ahvaz regardless of their income. Sham et al. (2018) examined the trip patterns and fear of crime among female travelers. The indices such as the evil people's aggregation, drivers' and other travelers' behaviors were consistent with the results of Sham et al. (2018). The difference of the two studies is that the present study identified the significance of all factors in public transport modes.

Riggs and Sechvarner (2018) studied the effect of cargo bicycles on women's trip patterns. In their research, they determined the extent of women's use of bicycles and focused on cycling infrastructure issues. The present study determined the rate of cycling in women of Ahvaz and found that only 2% of them use bikes for transport. The present study also explored the women's sociocultural barriers to using bikes and ranked and zoned the barriers. In other words, Riggs and Sechvarner explored the infrastructure issues of women who use bikes, but the present study addresses the social issues of society. The results of the present study were consistent with those of Sung et al. (2018) in terms of examining the sociocultural barriers of women using bicycles because both of them emphasized and community attitudes towards women who use bikes and their

ages. Jalson et al.'s (2018) studied on women's equality of power and knowledge of transportation planning, but based on feminist theories, seeks to identify the spatial differences and prioritize women's sociocultural barriers to public transport use. Summarily, this research is distinguished from other related studies in terms of the accurate, scientific and comprehensive identification of barriers and their application in measuring the women's sociocultural barriers to using four intra-city public transport modes. The present study is one of the first steps taken in Iran and the first one in Ahwaz city.

In the past decades, some cultural and social changes have led women to break down the barrier of homes and enter urban spaces. Being in space is an indisputable right for women, and they should enjoy the same conditions as men in urban spaces. However, many sociocultural barriers have limited women's presence in public spaces, especially when they use public transport. Therefore, this study aimed to investigate and analyze the women's sociocultural barriers to using public transport in Ahwaz. Moreover, ranking the barriers in each of the modes of public transportation and zoning them in the city were the operational objectives of the study. In order to achieve these goals, we have answered the following question: what are women's sociocultural barriers of in using public transport in Ahwaz metropolis? So, this study made attempts to analyze and explain these barriers, then identify the significance of each of these barriers in the four of public transport modes in Ahwaz, and finally find out how these barriers function in the city using zoning maps. Therefore, in this study, 30 items were analyzed in four of public transport modes in Ahwaz. These barriers have been categorized as sociocultural barriers to walking (12 factors); sociocultural barriers to taxi use (6 factors); sociocultural barriers to bus use (6 factors); and sociocultural barriers to cycling. The results showed that the sociocultural barriers of each women's age group are different in each public transport mode. Ranking these barriers revealed that the sexism looks, men's sexual looks, the relatives'/families' disapproval, and drivers' pointless conversations are the dominant barriers to walking, bus use, cycling, and taxi use, respectively. Zoning barriers across the city also indicates that the further one moves from north to south, the greater the barriers. A regional view of this zoning confirms that 90 % of districts 4 and 8 are in the high and very high ranges, and 30% of district 3 is in the high range. These districts are less favorable than other areas of Ahwaz, but district 2 is the most favorable in terms of using public transport because its entire area is in low and very low ranges. Therefore, the following suggestions are made to reduce the women's sociocultural barriers to public transport use:

1. Informing women of their civil rights based on the criminality of street harassment because women who suffer from this type of harassments can sue harassers and pursue legal proceedings.
2. Establishing an organizational unit consisting of the Department of Psychology, Sociology and Urban Planning in Municipalities to collect and measure women's sociocultural barriers to public transport use;
3. Creating a database for collecting women's sociocultural information when they are using public transport; and

4. Training and applying the research variables in the training programs of the relevant organizations, especially in the Taxation and Bus Organization, to reduce the women's sociocultural barriers to using public transport.

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