Research Paper

Gender Differences and Women's Preferences in Factors Affecting Bicycle Use (Case study: Shiraz, Iran)

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Abstract
This study seeks to investigate the effects of environmental factors on the use or non-use of bicycles according to gender in urban travels in Iran. To this aim, while conducting a questionnaire survey among 304 bicycle users (163 males and 141 females) within the dedicated bicycle network in Shiraz, the t-test and regression statistical tests were used to investigate the preference differences between the two groups. Based on the findings of the aforementioned statistical tests, both men and women faced barriers to using bicycles in urban travels, although a difference was observed between the two genders in the effective environment they preferred. This difference is especially significant regarding socio-cultural indicators considering the specific traditional-religious context in Iran. Therefore, in addition to indicators such as sense of safety, path security, using dedicated bicycle lanes, path greenness, and attractiveness, women's cycling is significantly affected by indicators such as community custom and people's judgment along with religious norms. Based on the analysis, education of women about the benefits of using bicycles and the creation of synergy between cultural and religious institutions of the society to remove social, cultural, and normative barriers for women's cycling in Iran along with planning to increase urban bicycle transportation lanes with the necessary environmental qualities and standards can increase the per capita and eliminate the disparity in the number of men and women who cycle in developing countries such as Iran.

Keywords: Women's cycling, Travel behavior, Gender differences, Shiraz.

1. INTRODUCTION

Despite passing more than 150 years since the invention of the bicycle, nowadays, it is one of the transportation options in cities. Such means of transportation are low-cost with little pollution and are effective options for active lifestyles and sustainable transportation in a situation where the health of citizens in many large cities is endangered due to reduced physical activity and increased obesity (Knoblauch et al., 2004).

Meanwhile, not only in developing countries but also in developed countries the gender gap in bicycle use remains a problem. Statistics of women's use of bicycles in many countries are significantly different from the level of men's use of bicycles. In Australia, this ratio is reported to be one-third (Garrard et al., 2008). In the United States, the ratio is at least 2 to 1 (Emond et al., 2009). In Canada, males account for 75% of bicycle users (Twaddle et al., 2010). In England and Wales, the number of female cyclists is significantly lower than men (Grudgings et al., 2018). And despite the increase in the number of cyclists in recent years in the UK, the rate of female use of this device has not changed much and the gender gap in this area is not filled (Aldred et al., 2017). Of course, this ratio is not very different in certain countries, namely, Germany, Denmark, and the Netherlands (Emond et al., 2009; Pucher & Buehler, 2008).

Based on the research, this gender and age gap is observed more among countries with a low share of cycling in transportation behavior (less than 5%) (Pucher & Buehler, 2008). Part of this low gender and age share of cycling is due to the poor quality of the cycling environment (Aldred et al., 2017). As in countries with a high share of cycling, the high quality of the cycling environment has equalized the share of age and gender groups in using bicycles (Aldred et al., 2016).

It is still a gap to study this issue in developing countries. In these countries, there are more serious challenges for women to use bicycles due to lower income levels, inadequate urban infrastructure, and built environment due to the speed of urbanization, socio-legal tensions, cultural-religious norms, and threats of harassment and violence in these countries (Peters, 2013; Rosenbloom & Plessis-Fraissard, 2009; Song et al., 2019; Tran & Schlyter, 2010) indicating the need for more and broader studies of the issue in these countries.

There is no specific study on the ratio of women to men cyclists in Iran, but the rate of bicycle use, especially as a means of urban transportation is quite limited in general. However, in recent years, in limited areas of some metropolitan areas, dedicated bicycle lanes have been provided and pilot shared bicycles were used in some of these cities. Meanwhile, women's use of bicycles in Iran, in addition to the general urban infrastructure, requires research in cultural, social, and psychological dimensions, and seemingly, even in environmental and physical-spatial priorities, women's concerns for using bicycles are different from men. The present study seeks to investigate gender differences and factors affecting women's acceptance of the urban bicycle network in Iran as one of the developing countries with specific social and cultural norms, with Shiraz selected as a case study. The main question of the research is: what are the differences between the variables affecting the rate of men's and women's cycling in Iran?

To this aim, while reviewing the literature and theoretical foundations of the subject, the research method and the sample will be introduced and then the most important findings will be explained and discussed. The research will close with the conclusion in order to answer the question and achieve the research objectives.

A large body of research was conducted in the last two decades on cycling and the factors affecting its increase among different social groups, including women, some of which investigated the factors affecting the choice of the bicycle as a mode of travel (Grudgings et al., 2018; Cabral et al., 2018; Handy et al., 2014; O'Hern et al., 2019). Others studied the urban infrastructure required for bicycles in different countries, sometimes with an emphasis on gender (Ashish Choudhary, 2016; Vanderschuren et al., 2017; Lusk et al., 2014; Hull & O'Holleran, 2014; Aldred et al., 2017). A number of studies investigated the gender differences in the relationship between urban planning and cycling (Mejía-Dorantes & Villagrán, 2020; Wheeler et al., 2010; Emond et al., 2009). Some studies investigated the reasons for the success of some European cities in the Netherlands, Germany, and Denmark in using bicycles (Pucher & Buehler, 2008; Harms et al., 2016).

In his study, Prati (2018) investigated the relationship between gender equality indicators (time, work, income, knowledge, power, health, and violence) in Europe with the rate of bicycle use. The findings specifically found a significant correlation between gender inequality in three issues, namely, time, violence, and using bicycles as an urban transportation system. In previous research, access barriers, emotional barriers, economic barriers, and administrative barriers (Mejía-Dorantes & Villagrán, 2020), environmental, cultural, social, and psychological factors, as well as factors such as a sense of security, family responsibilities, and housekeeping (Emond et al., 2009; Handy et al., 2010) were found to affect women's cycling. In particular, factors related to the artificial environment and urban infrastructure and especially the installation of dedicated bicycle lanes (Aldred et al., 2017; Garrard et al., 2008; Mitra & Nash, 2019; Cabral et al., 2018) and even details such as the presence of natural environments and greenery (Pánek & Benediktsson, 2017) were found to affect women's cycling.

Apparently, based on the findings of Twaddle et al., the share of bicycle travel in daily travel can be increased if the cycling needs of women are met (Twaddle et al., 2010). These needs are different in developing countries with specific local, cultural, and social contexts and need special consideration. To study how women's cycling can be promoted in Indonesia, Song et al. (2019) examined women's perceptions, attitudes, and behaviors in the low-income neighborhoods of Solo. The pace of urbanization and the car-centric style of transportation in recent years in this country (like many other developing countries) have widened the gender and age gap in accessing to bicycle network and left women, the elderly, children, and the disabled in low-income groups with inappropriate conditions. They believed that in addition to the common barriers in developed countries, religious and cultural norms, as well as social and legal contexts, have greatly affected women's cycling in this country (Song et al., 2019).

As mentioned in the introduction, a special investigation of the gender gap in cycling to understand the factors and barriers affecting women's cycling in developing countries in order to formulate management and planning strategies and policies to achieve maximum inclusiveness in active transportation in these countries seems necessary.

2. MATERIALS AND METHODS

This research was conducted with a descriptive-analytical approach and with the help of a survey. The research questionnaire was developed using the selected indicators from the literature review summarized in Table 1. In this Table, the items obtained from each index are separated. The questionnaire was developed in three parts and 39 items. In the first part, demographic questions (age, gender, education, etc.) were asked in the form of 6 items. In the second part, 8 items asked about the dependent variable of the research (amount and duration of bicycle use per week and per day) as well as other required information about the area of residence, transportation behavior in general, and barriers to bicycle use. In the third part, the main factors (independent variables) of 15 indicators were questioned in the form of 25 items. The questions in the third section were designed to measure independent variables with a 5-point Likert scale.

Table 1. Indicators, research, method of measurement and item

Dimensions		Variables	References	Description (questionnaire item)
1 Physical-spatial	1-1	Existence of dedicated bicycle paths	(Aldred et al., 2017; Emond et al., 2009; Garrard et al., 2008; Grudgings et al., 2018; Gutiérrez et al., 2020; Handy & Lee, 2020; Handy et al., 2010; Heinen et al., 2010; Hull & O'Holleran, 2014; Jahanshahi et al., 2018; Jahanshahi et al., 2019; Pánek & Benediktsson, 2017; Prati, 2018; Pucher & Buehler, 2008; Song et al., 2019; Twaddle et al., 2010)	Rate of using dedicated bicycle lanes Path clarity and the existence of specific separators
	1-2	Bicycle lane connectivity and continuity	(Grudgings et al., 2018; Heinen et al., 2010; Hull & O'Holleran, 2014; Prati, 2018)	The rate of connection and continuity of the cycling path
	1-3	Path steep	(Aldred et al., 2017; Grudgings et al., 2018; Heinen et al., 2010)	The suitability of the path steep
	1-4	Distance from the high traffic urban network (low and calming traffic of the path)	(Cabral et al., 2018; Grudgings et al., 2018; Jahanshahi et al., 2018; Jahanshahi et al., 2019; Prati, 2018; Pucher & Buehler, 2008; Song et al., 2019)	Proximity of cycling path with high traffic urban lines Cycling in low-traffic areas
2 Functional	2-1	Bicycles Parks	(Grudgings et al., 2018; Gutiérrez et al., 2020; Heinen et al., 2010; Pucher & Buehler, 2008; Song et al., 2019)	The possibility of parking a bicycle along the path Clear and specific bicycle parking lot
	2-2	Road security (no sense of accident risk)	(Aldred et al., 2017; Cabral et al., 2018; Emond et al., 2009; Grudgings et al., 2018; Harms et al., 2016; Heinen et al., 2010; Hull & O'Holleran, 2014; Jahanshahi et al., 2019; Mejía-Dorantes & Villagrán, 2020; Prati, 2018; Pucher & Buehler, 2008; Song et al., 2019; Twaddle et al., 2010; Vanderschuren et al., 2017)	Feeling of accident security and collision with motor vehicles Rate of concern about the accident risk
	2-3	Bicycle Network Access	(Emond et al., 2009; Gutiérrez et al., 2020; Jahanshahi et al., 2019; Mejía-Dorantes & Villagrán, 2020; Pucher & Buehler, 2008)	Rate of access to the bicycle network from work/residence place Availability of bicycle lanes in the city

Dimensions		Variables	References	Description (questionnaire item)
3 Landscape and Natural Environment	3-1	Attractiveness of the path	(Grudgings et al., 2018; Handy et al., 2014; Hull & O'Holleran, 2014; Jahanshahi et al., 2018; Lusk et al., 2014; Mejía-Dorantes & Villagrán, 2020; Pánek & Benediktsson, 2017)	The beauty and attractiveness of the path Attention to the surrounding scenery while cycling
	3-2	Air freshness	(Abasahl et al., 2018)	Attention to air freshness for cycling
	3-3	Air temperature and rainfall (climatic comfort)	(Abasahl et al., 2018; Aldred et al., 2017; Cabral et al., 2018; Grudgings et al., 2018; Heinen et al., 2010; Jahanshahi et al., 2018)	Attention to the climate for cycling
	3-4	Path Greenness	(Handy & Lee, 2020)	The rate of cycling path greenness Attention to plants and trees during cycling
4 Socio-Cultural Factors	4-1	Feeling safe	(Abasahl et al., 2018; Aldred et al., 2017; Gutiérrez et al., 2020; Jahanshahi et al., 2019; Mejía-Dorantes & Villagrán, 2020; Prati, 2018; Song et al., 2019)	Feeling safe while cycling The rate of exposure to verbal-behavioral harassment and violence during cycling
	4-2	People's judgment and attitude and the customs of society	(Grudgings et al., 2018; Heinen et al., 2010; Jahanshahi et al., 2018; Song et al., 2019)	The rate of attention to people's judgment and attitude for cycling Paying attention to the norms of society for cycling
	4-3	Religious norms	(Song et al., 2019)	Attention to religious norms for cycling
	4-4	Legal restrictions	(Jahanshahi et al., 2018)	Attention to legal restrictions during cycling

2.1. Case Study, Sampling, and Data

Shiraz is the capital of Fars Province and one of Iran's metropolises with a population of 1,565,000 people and an area of about 240 km^2 located in the southern half of Iran. Since 2017, part of the main paths of the city with a length of 6 km was equipped with a special bicycle lane, the location of which can be seen in Figure 1. Also, since 2019, a private company called "Bidood" has implemented a smart system of shared (lending) bicycles in this city. Although the equipping of this network and the possibility of using smart bicycles has increased the number of city trips by bicycles in these areas, however, in general, there are still very few urban trips by bicycles (there is no detailed statistical study in this regard). In addition,

some cyclists use bicycles for physical activity or recreation. This issue, which is also common in other metropolises of Iran, along with the low presence of women in these lanes, requires more detailed studies.

Bicycle users in Shiraz comprised the statistical population of the present study and sampling was conducted from March to June 2020. Due to the very small number of bicycle users in the city and the outbreak of the Coronavirus during this period, sampling was difficult and limited in the area of the city where the bicycle lanes were located (Figure 1). Since around 2017, Shiraz Municipality in this area allocated six main streets of the city and a total length of 6 km path for the bicycle. These lanes with about 2 meters width with special barriers and special signs were separated from the car transportation route. For

sampling, at the beginning or end of each main street, where it was possible to stop, 80 questionnaires were randomly distributed among men and women cyclists and they were asked to answer questions. Some of these questionnaires were sent online to bicycle users on these lanes during the Coronavirus outbreak. Among the 480 distributed questionnaires, 304 questionnaires were completed and returned in-person or online, which were used as the data in statistical calculations. In the pre-test, Cronbach's alpha coefficient was calculated to ensure the reliability of the questionnaire and the result was 0.834, confirming the reliability of the questionnaire. After descriptive studies on these data, the t-test was used to compare the mean in both men and women groups, and also linear regression test was used in SPSS software to evaluate and compare the effectiveness of the indicators in each group.

3. RESULTS

In this section, first, the findings of the questionnaire will be presented descriptively. The description of these findings shows the differences between men and women in the amount, purpose, and type of bicycle use. The results of linear regression are then presented analytically.

3.1. Data in terms of Demographic Survey

As seen in Table 2, among the questionnaires distributed, 163 questionnaires were related to men (54%) and 141 questionnaires were related to women (46%). Most users were under 40, a significant number were students with undergraduate degrees.

Table 2 indicates the descriptive statistics of the questions of the second part, among which, 'the rate of bicycle use', 'barriers to choosing a bicycle as a means of travel', and 'the purpose of using a bicycle' were provided in Figure 2 with more emphasis in the form of a comparison chart.


Fig 1. Study Area and Cycle Lanes

Table 2. Descriptive statistics of the questions of the first and second sections

Demographic & Individual Statistics			
Characteristics		Responds(%)	
		Men	Women
Sex		53	47
Age	18-30	47	46
	30-40	29	30
	40-50	14	12
	50-60	6	9
	60+	4	3
Highest Finished Degree	Diploma/ Sub-Diploma	30	17
	Associate Degree	9	7
	Bachelor	39	37
	Master	16	37
	P.H. D	6	2
Marital Status	Single	61	63
	Married	39	37
Occupation	Student	28	36
	Housewife/Househusband	1	16
	Freelancer/Self-Employment	41	22
	Teacher	3	2
	Employee	17	21
	Worker	3	0
	Retired	7	3
Characteristics	Responds(%)		
		Men	Women
Car Ownership	Yes	69	56
	No	31	44
Daily transportation Mean(s)	Metro	18	18
	Bus	10	16
	Taxi	8	18
	Personal Car	31	29
	Bicycle	30	18
	Motorcycle	3	1
Bicycle Usage Experience	< 30 Days	4	12
	1-3 Months	3	1
	3-6 Months	1	6
	6-12 Months	2	7
	1-2 Years	6	4
	> 2 Years	84	70
Weekly Bicycle Usage Rate	> Day a Week	25	45
	1-2 Days	28	30
	3-4 Days	27	15
	4-5 Days	6	5
	5-7 Days	14	5
Characteristics	Responds (%)		
		Men	Women
Average Duration of Each Bicycle Trip	< 15 minutes	7	14
	15-30 minutes	10	11
	31-60 minutes	20	22
	< 60 minutes	63	53
Major Usage Purpose	Travel to a Place	23	11
	Recreational/Fun	27	41
	Exercise and Physical Activity	50	48
Barriers in choosing bicycle as a mean of daily travel	Lack of Dedicated Bicycle Routes	24	20
	Lack of Bicycle Parking	24	19
	Social Norms	3	12

	Religious Prohibitions for Women	1	4
	Legal Prohibition/Relevant Laws	2	5
	Lack of Safety and Security	19	15
	Traffic Congestion	6	8
	Lack of Time	14	10
	Laziness	5	6
	Other	2	1
Type of Bicycle Used in Trips	Shared Bicycles (Rental, Bidood)	61	60
	Personal Bicycle	35	34
	Both	4	6
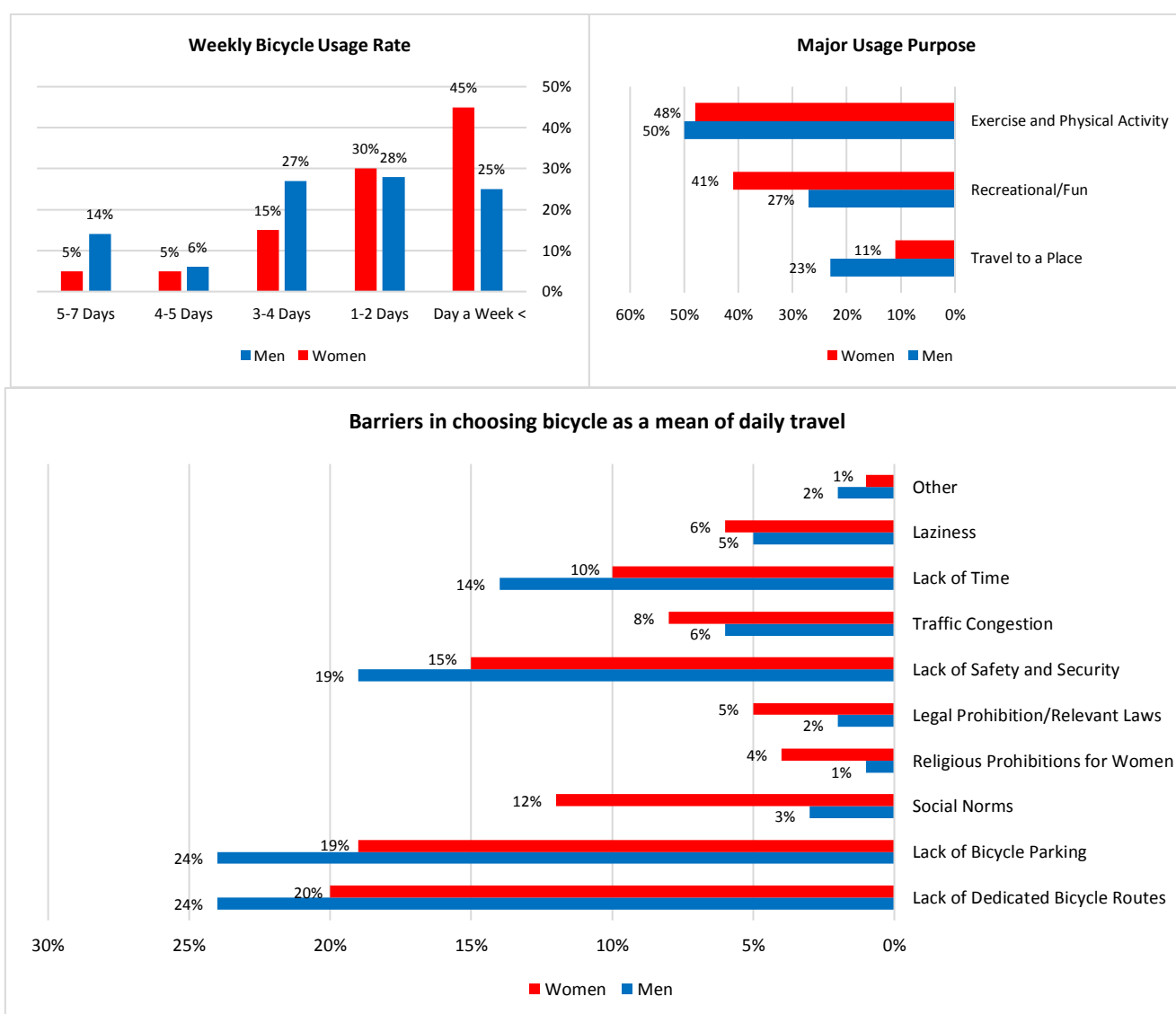
Fig 2. The rate of bicycle use, barriers to choosing a bicycle as a means of travel and the purpose of using a bicycle (separately for men and women)

As seen in Figure 2, men use bicycles as a means of travel and transportation almost twice as much as women. In contrast, women mostly ride bicycles for fun and leisure compared to men. A significant proportion of women cycle less than one day a week, but most men cycle between 1 and 4 days a week. Regarding the barriers to choosing a bicycle as a means of travel, in some cases, such as 'lack of dedicated bicycle lanes' and 'lack of bicycle parking lot', the statistics for men and women are relatively similar. But on the same subject, women were concerned about 'religious frameworks', 'customary and social attitudes', as well as 'congestion and traffic jams' as barriers to urban bicycle travel more than men.

Table 3 indicates the mean of descriptive statistics for the research variables separately for men and women, and Table 4 indicates the results of two samples of t-test. Findings from the t-test indicate that there is a significant difference between women and men in 8 of the 15 variables studied. According to this finding, for women, 'the existence of dedicated bicycle lanes', 'distance from the busy urban network', 'safety from road accidents', 'greenery space', and 'environmental attractiveness of the lane' were significantly more important than that of men. Also, 'security from violence and physical and verbal harassment' as well as 'society's custom and people's attitudes', and 'religious norms' were much more effective in women's cycling than that in men.

3.2. Findings of Linear Regression

Applying the linear regression model in the group of women indicated that in this group, the feeling of safety, distance from the busy urban network, people's judgment, the existence of dedicated lanes, greenery, religious norms and the attractiveness of the lane had a significant positive effect on bicycle use. Regarding men, access to the urban bicycle network, the possibility of bicycle parking, lane connection and continuity, the attractiveness of the environment, the existence of dedicated lanes, lane steep and security, and effective and significant variables on bicycle use were identified. In Table 5, the regression test was comparatively conducted between men and women.

Table 3. Descriptive statistics (mean)

Variables	Female			Male		
	N	Mean	SD	N	Mean	SD
Bicycles Parks		1.73	.89		1.61	.89
Existence of dedicated bicycle paths		3.65	.73		2.44	.85
Bicycle lane connectivity and continuity		1.90	.98		1.93	1.08
Security		3.76	1.08		2.21	1.14
Distance from the high traffic urban network		3.87	1.06		2.89	1.10
Bicycle Network Access		1.96	1.07		2.75	0.85
Attractiveness of the path		3.65	.97		2.84	1.07
Air freshness	141	3.83	1.07	163	3.96	1.18
Air Temperature and Rainfall		4.15	1.02		4.05	1.07
Path Greenness		3.86	1.03		2.54	.98
Path Steep		3.06	1.01		3.11	1.09
Feeling Safe		3.41	1.09		2.12	1.02
People's Judgment		3.28	1.11		2.07	1.01
Religious Norms		2.88	1.07		1.56	1.08
Legal Restrictions		3.11	1.37		2.80	1.45

Table 4. T-test Results

Variables	t	P Value	Mean Difference
Bicycles Parks	1.20	.23	.12
Existence of dedicated bicycle paths	.2.80	0.03	1.21
Bicycle lane connectivity and continuity	.25	.79	.030
Security	3.88	0.00	1.55
Distance from the high traffic urban network	1.95	0.01	0.98
Bicycle Network Access	.011	.99	-.001
Attractiveness of the path	1.21	0.00	.81
Air freshness	.92	.35	.13
Air Temperature and Rainfall	0.83	.40	0,10
Path Greenness	3.82	0.02	1.32
Path Steep	.41	.67	.05
Feeling Safe	3.80	.000	1.29
People's Judgment	3.71	0.02	1.21
Religious Norms	3.82	0.00	1.32
Legal Restrictions	0.32	0.45	0.31

Table 5. Regression Results

Variables	Women			Men		
	B	Beta	Sig.	B	Beta	Sig.
Bicycles Parks	.014	.018	.39	.284	.321	.032
Existence of dedicated bicycle paths	.321	.343	.025	.274	.286	.027
Bicycle lane connectivity and continuity	.035	.054	.24	.291	.312	.037
Security	.042	.048	.610	.121	.162	.043
Distance from the high traffic urban network	.364	.412	.011	-.055	-.070	.358
Bicycle Network Access	.010	.011	.903	.312	.325	.043
Attractiveness of the path	.186	.231	.029	.273	.294	.002
Air freshness	015	.020	.831	.084	.104	.226
Air Temperature and Rainfall	.159	.171	.075	.059	.074	.371
Path Greenness	.312	.321	.043	-.008	-.009	.922
Path Steep	.074	.082	.20	.131	.167	.046
Feeling Safe	.408	.435	.025	.013	.021	.35
People's Judgment	.321	.354	.021	.007	.010	.921
Religious Norms	.	.235	.026	.015	.019	.839
Legal Restrictions	.026	.038	.656	-.020	-.033	.699
R- Squer		0.158			0.148	

4. DISCUSSION

The comparison of differences in the rate of cycling, the purpose of cycling, and barriers to bicycle selection was conducted. The descriptive findings of the second part of the questionnaire items on the three questions of 'rate of cycling', 'purpose of cycling', and 'barriers to choosing a bicycle as a travel option' indicated differences between men and women (Table 2 and Figure 2). In general, 47% of the men in the study cycled between 3 and 7 days a week, but it was 25% for women. The lowest rate of cycling in the questionnaire of this study (i.e. less than one day a week) includes 45% of women and 25% of men. Men also mentioned bicycles as a means of daily transportation, about twice as many as women (30% vs. 18%). This lower rate of women cycling compared to men was reported in many studies. Except in countries where cycling rates are generally high, in other countries, even developed countries such as the United States and Australia, this difference can be seen (Garrard et al., 2008; Pucher & Buehler, 2008; Emond et al., 2009; Twaddle et al., 2010; Grudgings et al., 2018). Perhaps placing this amount next to the purpose of the trip and the barriers to choosing a bicycle can provide a better and more accurate analysis.

Regarding the purpose of the trip, the number of men who used bicycles as a means of travel is twice as many as women. In contrast, women used bicycles 1.5 times more than men for fun and leisure. When it comes to using bicycles for physical activity, the two groups were relatively equal.

Regarding the barriers to travel, the difference between men and women was evident in three subjects. Women, 2.5 times more than men, have chosen 'legal restrictions' as one of their barriers to cycling. This ratio is 5 times for 'religious norms' and 4 times for 'social issues and customary attitudes of society'. As mentioned in the introduction of the study, local and cultural conditions and contexts of each country are very influential in studying the factors affecting the use of bicycles. It can be said that socio-cultural issues are one of the most important and complex issues regarding women's cycling in Iran, which will be mentioned in the discussion of socio-cultural factors.

In three of the barriers to choosing the bicycle as a means of travel, men expressed factors such as lack of dedicated paths, the problem of bicycle parking location, and time problem (lack of time). It seems that because men's use of bicycles as a means of travel in the city was more than women's, they face more functional problems.

4.1. Difference between Mean and Priority of Indicators affecting Cycling Rate among Men and Women

The results of the t-test (Table 4) showed that among the 15 indicators affecting the rate of cycling, there was a significant difference between women and men in 8 indicators. Also, the results of applying the linear regression model in the two groups of men and women showed that, significantly, 7 indicators were effective in women's cycling and 5 indicators were effective in men's cycling. Accordingly, among these indicators, 'the existence of dedicated bicycle lanes' as well as 'bicycle path attractiveness' were common among the two groups. Priorities affecting the cycling rate of men and women were also different. For women, 'sense of safety', 'distance from the busy

urban network', and 'people's judgment and attitude' were the most influential indicators, while for men 'accessibility to bicycling network', 'the possibility of bicycle parking', and 'bicycle path connectivity' were mentioned as the most effective indicators on the rate of cycling.

In the physical-spatial dimension, there is a significant difference between the mean of women and men in indicators of 'the existence of dedicated paths' and 'distance from the busy urban network'. For women, the existence of dedicated cycling paths away from busy paths led to a greater sense of safety and peace of mind. This is an issue that is addressed in studies in other countries. In Australia, fear and anxiety about road safety and driver behavior were known to be the most important reasons that discourage women from cycling (Garrard et al., 2008). Women are more inclined to ride bicycles on dedicated paths (Garrard et al., 2008; Emond et al., 2009; Beecham & Wood, 2014; Aldred et al., 2017; Cabral et al., 2018).

Regarding the function dimension of performance, indicators had more importance and priority for men's cycling rate. For men, 'accessibility to cycling network' and 'the possibility of bicycle parking' were two effective indicators and top priorities for cycling rate. One of the reasons for this could be the difference between men's goals of cycling compared to women's. As mentioned, men use bicycles for daily travel more than women, thus, network performance and efficiency indicators were of higher priority for them.

In terms of landscape and natural environment, the attractiveness and the greenness of the path were significantly more important for women than men. In previous studies in China, Australia, and England, the higher environmental sensitivity of women and the effect of environmental attractiveness on their cycling were emphasized (Grudgings et al., 2018; Lusk et al., 2014; Pucher & Buehler, 2008). This effect could be investigated in "perceptual dimension" and the perceptual differences of men and women of the environment.

Finally, in the socio-cultural dimension, 'sense of safety', 'people's judgment and attitude', and 'religious norms' were among the influential indicators of women's cycling. In the discussion of the barriers to choosing a bicycle as a means of travel, different issues between men and women were related to this dimension. Regarding the effect of gender equality indicators on the rate using bicycles by women, other studies have also pointed to the limitations caused by the attitude and norms of the society toward women cycling (Grudgings et al., 2018; Prati, 2018). But in Iran, the issue is different

and more complicated due to differences in cultural and religious contexts. In this country, on the one hand, there is no official legal restriction to do so, but on the other hand, the major religious leaders and the religious spectrum of the society do not consider it desirable and even consider it illegal (Zabetian, 2017; Emadi, 2015). For this reason, the level of acceptance of this issue by the society is ambiguous and contradictory. On the one hand, because of its benefits for the mental and physical health of women, some encourage it, and on the other hand, the norms and customs of the society based on the traditional and religious beliefs, still do not consider it a normal and everyday thing. For this reason, it seems that even women who ride bicycles do not have a clear and confident mindset about this issue and are worried about the judgment of people or family in their mental background (Zabetian, 2017; Song et al., 2019). In addition, cycling in such situations, especially in smaller cities, can lead to security anomalies and verbal and behavioral harassment of women (Song et al., 2019; Emadi, 2015). In recent years, the expansion of dedicated urban bicycle networks in Iran and the activities of private companies on shared bicycles, with the relative increase of cycling culture in cities, has also increased the presence of women in this field.

It seems that increasing the cycling culture and improving its infrastructure, in general, can also increase the rate of cycling for women, which is also true in other countries (Pucher & Buehler, 2008; Aldred et al., 2016; Aldred et al., 2017). In a similar experience in Indonesia, which has similar cultural-religious conditions to Iran, social and religious norms are examined as factors affecting women's cycling in this country (Song et al., 2019).

In general, it seems that 'culturalization' and 'education in the context of social life' are the most important strategies to increase the cycling rate of different social groups, especially women in developing countries. Emadi's (2015) research shows that the most important barrier to women cycling in Iran is the cultural barrier (Emadi, 2015). While improving environmental infrastructure and increasing the efficiency of network performance are effective, but certainly, cultural and social factors should be fundamentally prioritized in urban management strategy. This is an issue that has been emphasized even in the research of developed countries (Pucher & Buehler, 2008; Aldred et al., 2015; Aldred et al., 2017). Bicalho et al. (2019) in their study focused on the effect of changing the attitude of planners towards travel by cycling through educational and cultural processes in several cities of Portugal and emphasized its effect. A study in South

Africa also found that strengthening cultural and social contexts was effective in promoting active transport, including cycling, in the country (Vanderschuren et al., 2017). The effect of education and culture on a local scale, in Portland and Organ, in the form of the slogan 'shopping with bicycle' is one of the examples that is considered in studies (Pucher & Buehler, 2008). In the cultural field of Iranian society, in addition to the general culturizing about cycling, the issue of the presence of women requires more effort and the agreement and support of social and religious institutions of the society. For some women in the community who have religious affiliations, the possibility of using a bicycle to increase physical activity in specific and separate spaces may be a cross-sectional strategy, something that is still present in some parks or gardens dedicated to women in Iran. Education and culturalization in Iran should be done by emphasizing the benefits of cycling for the city in general and for women's health in particular, with the audience of the women's community on the one hand and bringing together cultural and social institutions and leaders in order to gain their approval and support on the other hand.

5. CONCLUSIONS

This study sought to investigate the effects of gender differences on the factors affecting the use of bicycles in developing countries and especially in Iran, and the city of Shiraz was selected as a case study sample in this study. In order to answer the main question of the research, a questionnaire of the most important indicators mentioned in previous studies was developed and distributed among bicycle users in two groups of males and females in Shiraz and the data were analyzed using SPSS software. Although the study was conducted among bicycle users, the findings showed that the rate of cycling among men was almost twice that of women, and the purpose of cycling among women was addressed mostly as 'recreation and leisure', and 'traveling and daily affairs' has been mostly the goal of cyclist men. Also, the analyses on the variables affecting the rate of cycling showed the significance of the effect of 5 indicators among men and 7 indicators among women. These differences, in addition to the physical dimension such as 'the existence of dedicated bicycle lanes' and 'distance from the busy urban network' as well as the natural-climatic environment dimension such as 'bicycle path greenness and attractiveness', especially in socio-cultural factors and 'judgment and people's attitudes', 'religious norms' and 'legal restrictions' highlighted themselves. The analysis of this issue depends on the specific socio-cultural conditions of Iranian society, in which special traditional, religious, and social norms do not allow women to ride bicycles. Accordingly, the most important strategy that can be pursued in order to increase the rate of women's cycling is to focus on 'culture and education' with the audience of women on the one hand and influential religious, social, and cultural institutions on the other hand.

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