



Comparing the effect of lifestyle, travel and residential attitudes on male and female commute mode choice

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KEYWORDS

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Abstract. Due to the differences between men and women, they are expected to exhibit different travel behaviors. In developing countries, there are limited studies on citizen travel behavior. The main aim of this study is to clarify the transportation behavior distinctions between men and women by modeling the effect of lifestyles and attitudes on the commuters' mode choice. For this purpose, an interview questionnaire was designed, and 979 participants were interviewed in Tehran. Questions were posed about attitudes toward transportation, attitudes toward residential location, and lifestyle of individuals. The results of factor analysis indicate a significant difference between men's and women's lifestyles and attitudes. The total effect of public oriented, walking oriented and vehicle oriented attitude on car use for men (women) are 0.149 (0.138), -0.145 (0.088), and 0.234 (0.324) respectively. These results show that men with walking-oriented attitude use car less but women with this attitude use car more. These differences verify the importance of making transportation policies addressing gender distinctions.

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1. Introduction

The rising demand for trips with private car has prompted policymakers to focus on transportation management strategies as a means of improving the efficiency of available road networks and reducing the negative effects of car use. The goal of all of these strategies is to reduce personal vehicle travel during congested times and places. However, research shows

that the expected effects are not always seen after such strategies are implemented.

First reason for the gap between prediction and reality outcome of policy implementation could be in attention to behavioral aspects of mode choice decision and just considering objective traditional variables such as travel time rather than accounting the influence of subjective factors [1,2]. Recently, in travel behavior analysis of individuals, new views of social psychology have emerged. There is an indication that mental factors such as personal attitude and past experiences of individuals regarding their trips [3,4] offer a better prediction compared with objective variables used in

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discrete choice models of trip mode choice [5]. Accordingly, different trip behavior patterns may be observed in a neighborhood with the same characteristics or among a group of similar individuals in terms of socioeconomic status. This is related to another concept called lifestyle. Lifestyle has a major effect on people's attitudes towards their families, work and leisure and eventually builds their travel behaviors [6–8]. Furthermore, one of the most important policies of interest in recent years to planners for transportation is policymaking regarding use of car [9–11]. As a result, the first aim of present study is to consider the effect of behavioral factors on car use.

Second reason for the aforementioned gap between prediction and reality outcome of policy implementation could be the overestimation effect of built environment characteristics on travel mode choice especially in implementing land use strategies and Transportation Oriented Development (TOD) policies [7,12]. While analyzing the interaction between trip behavior and land-use factors, studies suggest that the built environment characteristics of residential areas affect the travel behavior of people [13,14]. However, the relationship between these factors and the magnitude of their effects are still of interest to researchers [14,15]. Meanwhile, the causal nature of human-made environmental characteristics and travel behaviors is the most important challenge of previous studies [16]. A household may form its travel behavior based on the residential location. Meanwhile, a family may choose its residential location based on its travel attitude. Logically, by changing the environmental factors of the residential location, the transportation decisions would also change [7]. Although in recent years more attention has been paid to the relationship between land use and trip behavior in transportation studies, so far, only a limited number of studies have focused on the effect of lifestyle of individuals and their attitudes towards transportation and land-use in relation to choosing trip modes [7,10]. In this regard, a better understanding of the formation of travel behavior of individuals is achieved if these factors are considered alongside other effective variables.

The consideration of factors such as lifestyle, travel attitude, and land-use in interaction with each other as well as their indirect effects on trip mode choice can lead to a better understanding of the trip behavior of citizens. Travel behavior can generally be defined as what people do over space and how people use transportation to achieve their destinations. In the present research, the effect of lifestyle as well as transportation and residential attitudes of citizens on mode choice (as one of the most important travel decisions) is analyzed. Although, discrete choice models are used for disaggregate outcomes [17–21], in present study, considering the complex relationship between the above-mentioned

factors, structural equations modeling is used similar to previous studies in this area [22,23]. So, the second aim of the present study is to consider the complex relationship of lifestyle, travel attitude, land-use, and effect of these factors on car use. The results of analysis lead to better understanding the role of residential location characteristics in mode choice decision.

Finally, third reason for the gap between prediction and reality outcome of policy implementation could be that policies are frequently enacted as if one size fits all, that is, as if all sectors of society will react in the same way. In practice, there is substantial evidence that men and women travel differently and women are more sensitive to factors influencing that behavior [24]. It is critical to better understand these fundamental differences in behavior of genders in order to improve transportation planner's ability to make decision for transportation management. The peculiarity of women's travel behavior was first propounded seriously in 1970 [25]. Before then, many preliminary studies about transportation dealt with the peak hours of traffic and work trips, and in most cases, the travel behavior of men was examined as they constituted the majority of the employed people at that time [26]. The travel behaviors of men and women are very different. Men and women have pronounced differences in their physical and psychological attributes, and these attributes affect all aspects of their daily lives, including emotion, attitude, and travel behavior [26]. Men and women have different roles in the family, and, accordingly, have different needs in terms of transportation services and facilities to fulfill their tasks [27]. Due to the significant difference in the extent of vehicle ownership between men and women, the trip options of these two groups are not the same; thus, their trip behavior is also different [28]. Furthermore, in many cases, the participation rates of the different genders are different across occupations, which induces different conditions for their travel behavior [29].

In examining the differences between women's and men's travel behaviors, most studies dealt with various characteristics of travel behavior, such as travel mode choice, time of travel, goal of travel, route of travel, chain of travel, duration of travel, car type and transportation safety [18,30–32]. Studies suggest that women usually have shorter work trips [33], and their non-work trips are more frequent than those of men [34]. Meanwhile, women use public transportation and walking more than men [35], while men use their personal vehicles for their trips more often [35]. Women are more interested in environmental issues than men and appreciate decreasing usage of personal vehicle; therefore, they present a different travel behavior compared with men [36]. Also, it Evidently, the considerable participation of women in activities done outside the house and their daily performance of

trips alongside men further highlight the importance of the issue. Accordingly, any transportation policy that takes care of the different travel behaviors of men and women can make decision-making in urban transportation more efficient.

Generally, previous studies even in developing countries were based on quantitative statistical comparison of diverse travel behaviors among men and women. Further, few attempts have been made to perform behavioral comparison of men and women concerning the role of variables such as land-use, lifestyle, and attitudes of individuals [31]. Generally, in most countries, these studies are very limited [37,38] and don't consider any gender differences too [39,40], except for USA [41]. Therefore, the third and main goal of present study is to investigate the behavioral differences between men and women in choosing personal vehicle as mode of transport.

Also, studies performed in developing countries have affirmed the differences in the travel behaviors of men and women [24]. The growth rate of employed women in recent years in developing countries, including Iran [42], has been fairly steep, and the increase in the percentage of female students in Iran confirms this trend. Accordingly, investigating the travel behavior differences between men and women in developing countries is essential. Most studies regarding the travel behavior of women were performed in developed countries [43]. Although, studies in developing communities are important but the number of this type of study conducted in developing countries, such as Iran [24], Brazil [44], India [45,46], Pakistan [47] and South Africa [48] are limited. In addition, these studies have two major limitations. First, just considering basic socio-demographic variables [46] and second one, the analysis limited to simple descriptive statistics and Anova analysis [47] rather than behavioral models. So, the fourth goal and main contribution of this paper is as follows: as far as we know, it is the first time which the different effects of travel behavioral factors on mode choice among genders in developing country (Iran) have been analyzed.

2. Materials and methods

2.1. Data and study area

The data used in this study was based on the authors' field survey, conducted in Tehran (capital city of Iran) in 2018. Tehran has an area of 730 km² and population of 8.7 million citizens. It is the largest city of Iran [49]. The questionnaire used in this research includes questions about the travel attitude, residential attitude, and lifestyle of respondents, in which a 5-option Likert scale (absolutely disagree, disagree, no idea, agree, absolutely agree) was used to capture the comments of citizens. The questions of these sections

were designed or in some cases localized based on previous studies [22,24] and according to the objectives of the present research. In this study, the frequency of car use on commute trips within a week was considered as the travel behavior.

Sampling was performed randomly in the workplace of individuals (public places such as offices, shopping malls, gas stations, and parking lots with employees). This was done by dividing the map of Tehran into different parts at different distances from the city center and based on the diversity of administrative and commercial uses, such that some places were predetermined for the interview. After specifying the limit of the sample size based on the population of the study zone, 1049 persons were interviewed. Eventually, 979 questionnaires, which were acceptable and complete, were used for this study. Out of this number, 255 and 724 questionnaires were filled by women and men respectively. The women share in sample (26%) is near to ratio of female to male labor force participation rate in Iran (24% for 2018) [42]. The mean Cronbach's alpha is equal to 0.84 (0.78 – 0.88) indicating significant internal consistency.

2.2. Factor analysis and structural equation modeling

For investigation and modeling of attitudes, the survey questions have to be converted to fewer factors. For this purpose, factor analysis or principal component analysis approach was used [50]. Structural equation modeling is used for the complex relationship between behavioral variables in the present study. Statistically, structural equation modeling represents a wide range of general linear modeling methods, including Analysis of Variance (ANOVA) and multiple regression analysis [51]. In structural equation modeling and in the causal assumption chain, one variable can simultaneously be considered as a source variable (also called exogenous variable, which is similar to independent variable) and a result variable (also known as endogenous variable, which is similar to dependent variable). The variables that belong to the latter group are also called intermediate variables [51].

3. Results

Tables 1 to 3 report the pattern matrixes of lifestyle factors (54.7% variance explained), travel attitude factors (73.4% variance explained) and location attitude factors (65.1% variance explained) respectively. In the questionnaire, 26, 16, and 15 questions were posed about attitude toward transportation, attitude toward residential location, and lifestyle of individuals respectively. Since the ratio of the number of questionnaires to the number of items was larger than 20 to 1 in all cases, the dimensions of the sample taken seem to be

Table 1. Pattern matrix of lifestyle factors.

Question	Satisfied	Luxury oriented	Unhealthy	Work oriented	Family oriented	Extrovert
I have accomplished most of my desires in the life	0.829					
Generally, I am satisfied with the life	0.765					
Sometimes the life seems to be dark and frustrating	-0.658					
If I can afford, I always purchase the most expensive items		0.861				
I enjoy possessing luxurious household items and famous clothing brands		0.796				
If I have enough money, I am no longer interested in my job		0.315				
I usually follow my exercise program regularly			-0.884			
I absolutely don't do exercise in the week			0.880			
I am interested in allocating most of my time to my job				0.802		
Usually, I do not go out for recreation during weekdays				0.662		
Typically, I do outside house recreations with groups					0.845	
I spend most of my time with my family or friends					0.742	
I usually wander around the streets for recreation						0.796
I always go out for recreation at weekends						0.591
I often participate in social activities						0.352

adequate. Also, Kaiser-Meyer-Olkin measure for all cases was larger than 0.6.

3.1. Comparative analysis of factors

Ensure in this part, the mean load of each factor was compared between men and women (Table 4). Most of differences between men and women are statistically significant. In the lifestyle part, it was found that women are satisfied with their lives, while men are not. A notable point is observed in the results about luxurious life; both men and women are luxury oriented. Men are unhealthy, while women are more interested in exercise. The lifestyle of women is more work oriented compared with men. This means that they do not seek recreation on working days, which may indicate their commitment to the responsibility they accept. Women are more family oriented than men, while men are not very willing to be in gatherings. Finally, men are more extrovert and prefer to spend their time outside the house, while women, with a negative mean, are less willing to engage in outside-the-house recreation.

Regarding travel attitude, it was observed that being public oriented has a negative value in men, while it is positive for women. This suggests that women are willing to use public transport, while men are not. This result was also observed in previous

research [41,43,52]. Nevertheless, some studies found the opposite [53]. Also, women's tolerance of traffic is low, while men are more tolerant. Furthermore, women are willing to walk, while men are not. This seems logical; men have a positive attitude towards using motorcycle, while women are against using motorcycle (note that it is not common to find women riding motorcycles in Iran). In addition, men are negative about being optimal oriented and care less about fuel consumption and allocating shorter travel time, while women are optimal oriented. This may be due to men being more employed and their higher income than women [42]. Both men and women aren't caring for air pollution. Men are more vehicle oriented compared with women and the greater willingness of men to use vehicles was also observed in previous studies [52]. There are pronounced differences between men and women in their travel attitudes.

Concerning residential attitude, it was observed that women, contrary to men, would rather reside in residential locations with less population density. Concerning the attitude of walking safety, no surprising result was observed. This means that due to the positive attitude of women towards the use of public transport, women are also more concerned about this issue when selecting their residential location. Also, men are not family oriented, while women prefer

Table 2. Pattern matrix of travel attitude factors.

Question	Public oriented	Low tolerance	Walking oriented	Motorcycle oriented	Optimum oriented	Not caring for pollution	Vehicle oriented
I use public transportation because of being inexpensive	0.712						
Use of public transportation is bothering for me to get to the workplace	-0.569						
One of the reasons of using public transportation for me is getting rid of the troubles of vehicle use	0.552						
I prefer to use public transportation to get to my destination as much as possible	0.544						-0.354
I am ready to use public transportation to reduce air pollution	0.476					-0.364	
Since I may not find a parking space at my destination, I use my vehicle less frequently	0.43						
The long duration of reaching the destination bothers me a lot		0.809					
Getting stuck in traffic makes me very irritable		0.778					
Walking compared to use of public transport is simpler for me			0.823				
Walking is simpler for me compared to driving			0.715				
I prefer to walk to my destination as much as possible			0.714				
I like walking and jogging			0.662				
If the facilities of bicycle use are provided, I choose bicycle to get to my destination			0.438				
In my opinion, the best mode of transport is motorcycle				0.839			
Motorcycle has low safety; thus, it is not logical to use it				-0.82			
I usually use telephone and Internet instead of in person visits					0.694		
I usually prefer to buy my necessities from the closest shop					0.65		
One of my most important criteria in purchasing a vehicle is its extent of fuel consumption					0.398	-0.386	
We need more expressways, even if we should pay more urban tolls						-0.638	
Only the government and car manufacturers are responsible for reducing air pollution						0.575	
I try to use my personal vehicle less in order to improve air pollution						-0.415	
If the congestion charge zone is not on my way, I definitely use my private car							0.729
Since I cannot accomplish all my work through public transportation, I use personal vehicle							0.647
Driving is one of my recreations						0.634	
I am used to utilizing personal vehicle and the life would be difficult without it for me						0.588	
In my opinion, the best mode of transport is use of personal vehicle						0.551	

Table 3. Pattern matrix of residential attitude factors.

Question	Low density oriented	Walking safety	Relative oriented	Easy access	Not caring for the residential location environment
The neighborhood's building density	0.826				
The vehicle density in the streets of the neighborhood	0.817				
Suitable marginal parking space	0.534				
Residential location being of house (not apartment) type	0.509				
Suitable sidewalks		0.791			
Safety of walking		0.702			
Proximity to public line stations		0.559		0.38	
Safety for children's playing		0.473	0.357		
Proximity to residential location of relatives with whom you have frequent visits			0.765		
Homogeneous ethnic texture of the residential location			0.693		
Proximity to the residential location				0.78	
Easy access to expressways				0.605	
Proximity to shopping centers (grocery stores, Shahrvand chain store, Kurosh Mall, etc.)				0.496	
The extent of noise					-0.879
The air pollution of the region of residential location					-0.855
Park and green space		0.335			-0.369

Table 4. The mean values of the lifestyle, travel attitude and residential attitude factors compared between men and women.

Question	Factors	Men	Women	Absolute T-value	Significance
Lifestyle	Satisfied	-0.111	0.176	4.401	0.000
	Luxury oriented	0.093	0.146	2.959	0.003
	Unhealthy	-0.039	0.062	1.564	0.118
	Work oriented	-0.052	0.081	2.037	0.042
	Family oriented	-0.012	0.018	0.467	0.640
	Extrovert	0.083	-0.130	3.273	0.001
Transportation	Public oriented	-0.017	0.027	0.682	0.496
	Low tolerance	-0.035	0.055	1.378	0.169
	Walking oriented	-0.084	0.133	3.369	0.001
	Motorcycle oriented	0.084	-0.132	3.337	0.001
	Optimum oriented	-0.090	0.141	3.564	0.000
	Not caring for air pollution	0.026	0.041	1.012	0.312
	Vehicle oriented	0.074	-0.117	2.960	0.003
Land use	Low density oriented	-0.019	0.030	0.741	0.459
	Walking safety	-0.079	0.124	3.120	0.002
	Relative oriented	-0.069	0.109	2.742	0.006
	Easy access	-0.030	0.048	1.179	0.239
	Not caring for place of residence environment	0.080	-0.126	3.236	0.001

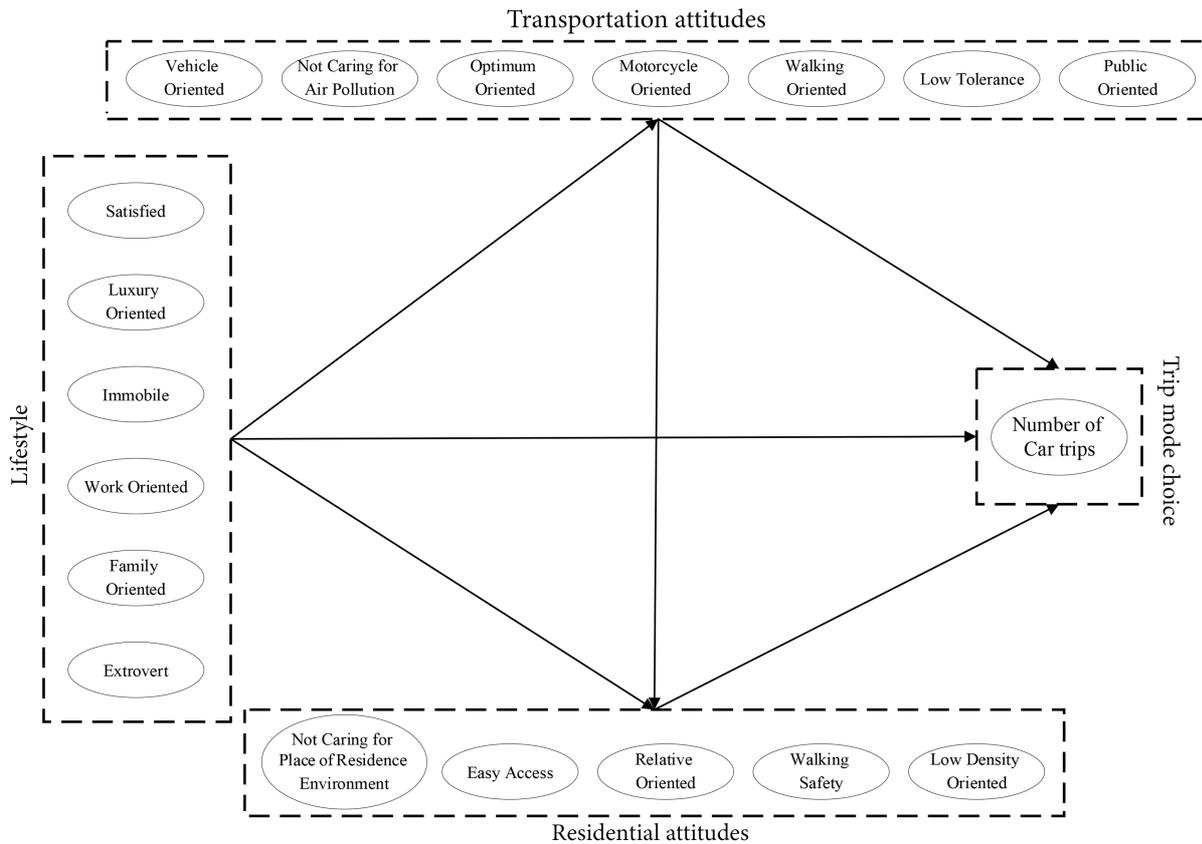


Figure 1. Conceptual structural equation model.

residential locations that are close to their relatives. Easy access to the expressway and shopping centers as well as proximity to the workplace are also more important to women than for men. Similar results were also observed concerning the importance of access to shopping centers in the study by Guan et al. [52]. While women care about the environment of their residential location, men do not consider it as important.

The attitudes of women and men towards the nature of residential location are very different. Accordingly, it is expected that the difference in people’s attitude regarding selection of residential location would also reflect in other behaviors, such as travel behavior. The results of this section indicate that most attitudes associated with women’s and men’s transportation are significantly different, which naturally influence their travel behaviors as well. Expectedly, separate analysis of the travel behavior of these two groups would yield different results.

3.2. Structural equation model

In the present study, it was assumed that in the decision-making process of people, lifestyle is the main source of influence on their travel behaviors. This assumption was also considered in previous studies [54]. Travel mode choice is affected by objective and subjective determinants [55]. It was also assumed that

the travel attitudes of people affect their residential attitudes, which eventually result in the selection of a particular mode of trip. Accordingly, in the first step, formation of travel attitude based on the lifestyle factor was considered in the theoretical structure. Thereafter, the assumption that travel attitude alongside lifestyle factor constitute the residential attitude of a person was propounded. Lifestyle, residential attitude, and travel attitude lead to decision-making regarding mode of transport. Eventually, the direct and indirect effects of the travel attitude, residential attitude, and lifestyle of a person on travel behavior (the frequency of using personal vehicle) were investigated.

The conceptual structure of this study based on the mentioned assumptions is presented in Figure 1. A Maximum Likelihood (ML) method was used to estimate the models. This method reveals how well the model can explain the observed variances and covariance between measures. The normal distribution of variables is required for ML estimation of a Structural Equation Modeling (SEM) [56]. Because some key variables in this study (attitudes) are categorical, the normality check in model estimation has been carefully considered.

Table 5 presents the summary of goodness-of-fit for SEM model. These values compare well to standard values which have been showed in the table

Table 5. Goodness-of-fit measures.

Model standard value	$v^2/df < 2$	$NFI > 0.95$	$CFI > 0.95$	$RMSEA < 0.1$
Model-based value	1.95	0.97	0.99	0.056

Table 6. The total standardized interrelation effects of travel attitude and residential attitude based on gender (Male and female).

Attitude Factors	Travel attitudes based on gender male (Female)							Residential attitudes based on gender male (Female)				
	Public oriented	Low tolerance	Walking oriented	Motorcycle oriented	Optimum oriented	Not caring for air pollution	Vehicle oriented	Low density oriented	Walking safety	Relative oriented	Easy access	Not caring for residential location environment
Satisfied	-0.321 (-0.518)		-0.376 (-0.301)		0.044 (0.166)	-0.172 (-0.120)	0.291 (0.322)	0.213 (0.800)	-0.353 (-0.226)	-0.295 (-0.225)	0.132 (0.030)	0.185 (0.402)
Luxury oriented		-0.340 (-0.249)	0.437 (0.396)	-0.386 (-0.448)	-0.356 (0.024)	0	-0.388 (0.158)	0.075 (0.071)	0.059 (0.293)	-0.070 (-0.040)	-0.374 (-0.055)	-0.107 (-0.239)
Unhealthy	-0.241 (-0.116)	-0.158 (-0.290)		-0.350 (0.126)		0.137 (0.209)	-0.117 (-0.263)	-0.247 (0.163)	-0.176 (-0.516)	-0.133 (-0.204)	-0.128 (0.253)	0.270 (0.370)
Work oriented	0.083 (0.047)		0.206 (0.330)	0.110 (0.044)	-0.426 (-0.589)	-0.421 (-0.181)	-0.054 (-0.293)	0.568 (0.525)	0.376 (0.263)	0.273 (0.146)	-0.033 (0.335)	-0.323 (-0.262)
Family oriented		-0.152 (-0.105)		0.261 (-0.086)	0.403 (0.285)			-0.412 (-0.541)	0.028 (0.030)	0.366 (0.065)	0.387 (0.131)	-0.061 (0.107)
Extrovert	-0.267 (-0.317)		0.157 (0.007)	-0.264 (-0.424)	-0.151 (-0.198)		0.317 (0.064)	0.164 (-0.174)	-0.410 (-0.459)	-0.525 (-0.738)	-0.348 (-0.430)	0.707 (0.469)
Public oriented								0.232 (0.393)	0.477 (0.066)	0.412 (0.503)	0.130 (-0.478)	-0.147 (-0.003)
Low tolerance								0.464 (0.193)	0.154 (-0.186)		0.466 (0.209)	0.182 (0.266)
Walking oriented								0.230 (0.024)	0.273 (0.516)	0.17 (0.247)	-0.033 (-0.136)	0.092 (0.280)
Motorcycle oriented								-0.060 (0.204)	0.197 (-0.119)	0.374 (0.307)	0.209 (-0.311)	-0.106 (0.091)
Optimum oriented								-0.023 (0.131)			0.420 (0.605)	0.144 (-0.076)
Not caring for air pollution								-0.249 (0.425)			-0.156 (0.080)	0.389 (0.323)
Vehicle oriented									-0.175 (-0.067)		-0.074 (-0.649)	0.372 (0.457)

too. According to the results obtained from AMOS software, the relationships between variables that were not statistically significant were removed from the model structure. As shown, three groups of factors, including lifestyle, travel attitude, and residential attitude, resulted in the selection of personal vehicle. Each group consists of a number of principal factors, which are also associated with the principal factors of the two other groups. To simplify the model representation,

the relationship between factors was not drawn. In Table 6, the relationships between variables (factors) for men and women in model are presented.

The direct and indirect effects as well as the total effect of the principal factors of attitude (variables) on the choice of personal vehicle as mode of trip are assessed in Table 7. The results of previous studies suggest that when the model of interest only includes residential attitude and trip mode choice, the effect

Table 7. Direct, indirect and total standardized effects on car use for working trips for men and women.

Type of attitude	Factors	Car use based on gender male (Female)		
		Direct effect	Indirect effect	Total effect
Lifestyle	Satisfied	0.382 (0.488)	0.082 (−0.104)	0.464 (0.384)
	Luxury oriented	−0.128 (−0.19)	−0.371 (0.038)	−0.5 (−0.152)
	Unhealthy	0 (0.328)	−0.115 (−0.887)	−0.115 (−0.559)
	Work oriented	0.073 (−0.228)	0.019 (−0.142)	0.093 (−0.37)
	Family oriented	0 (0.294)	0.176 (0.096)	0.176 (0.390)
	Extrovert	0.041 (0.412)	−0.194 (−0.36)	−0.153 (0.053)
Transportation	Public oriented	−0.064 (−0.006)	0.213 (0.144)	0.149 (0.138)
	Low tolerance	0.105 (0.415)	0.154 (−0.288)	0.259 (0.128)
	Walking oriented	−0.256 (−0.365)	0.111 (0.453)	−0.145 (0.088)
	Motorcycle oriented	0 (0)	0.154 (−0.034)	0.154 (−0.034)
	Optimum oriented	0.184 (−0.043)	0.066 (−0.186)	0.250 (−0.229)
	Not caring for air pollution	0.032 (−0.05)	−0.029 (−0.181)	0.002 (−0.231)
	Vehicle oriented	0.231 (0.260)	0.003 (0.064)	0.234 (0.324)
Residential	Low density oriented	0.139 (−0.299)	0 (0)	0.139 (−0.299)
	Walking safety	0.074 (0.800)	0 (0)	0.074 (0.800)
	Relative oriented	0.335 (0.171)	0 (0)	0.335 (0.171)
	Easy access	0.141 (0.255)	0 (0)	0.141 (−0.255)
	Not caring for residential	0.070 (−0.105)	0 (0)	0.070 (−0.105)
	Location environment			

of residential attitude on trip mode choice is overestimated [55]. Considering factors such as travel attitude, which influences residential attitude, the standard value of the direct effect of residential attitude on the choice of mode of transport diminishes and reaches the actual value. In majority of studies that focused on the effect of land-use on trip mode choice, only the direct effect of land-use was estimated [7,57]. Based on the above explanation, such studies can distort the actual results. In this study, through structural equation method, while investigating the role of an individual's attitude in travel mode choice. Therefore, it is possible to more accurately investigate the differences between men and women with regards to the direct and indirect relationships between their attitudinal factors and car use.

Results indicates the relationship between variables (factors) for men and women in the personal vehicle choice model. Concerning the relationship between lifestyle and travel attitude, men and women that were satisfied with their lives were mostly optimal

oriented and were willing to use personal vehicle in their trips. Freeman et al. concluded that personal vehicle users are more satisfied with their lives (compared with public transport users) [58]. Luxury oriented men did not have an optimal oriented attitude and were not positively disposed towards the use of car. However, luxury-oriented women were optimal oriented and willing to use vehicle. Further, while luxury-oriented men and women are interested in walking, they have a negative attitude to motorcycle. Men and women who care less about exercising did not show any willingness to use public transport and vehicle. These individuals are also negligent of air pollution. The above results are evident given the unhealthy characteristic of these individuals.

The effect of work-oriented lifestyle on travel behavior is similar for men and women. In other words, men and women who pay great attention to their jobs are willing to use public transport, walking, and motorcycle, while they do not like to use their cars. Although they are not optimal oriented persons,

they are concerned about air pollution. It seems that those who pay great attention to their jobs are more willing to use public transport and walking; possibly, they consider these modes of transport more reliable to arrive at their workplace. Air pollution is also important for them; therefore, it is logical that they are not interested in using car. Men and women with family-oriented lifestyle are tolerant and optimal oriented people. Extrovert men and women are not willing to use public transport and motorcycle, and they are not optimal oriented either. However, these individuals have a positive attitude towards walking and use of personal vehicle.

According to the results shown in Table 6, concerning the relationship between lifestyle and residential attitude, numerous variables are significant. The results suggest that those who are satisfied with their lives usually opt for low density areas, are not interested in walking in their residential locations. In selecting their residential locations, they pay attention to easy access, and the environment of their residential locations does not matter to them. The effect of this variable on all attitudes of land-use is the same among men and women. Men and women with luxury-oriented lifestyle care about the environment of their residential locations.

Unhealthy lifestyle causes the emergence of contrasting attitudes between men and women with respect to residential location in low density area and easy access to it. Women who do not care about exercise prefer low-density places with easy access, while the men in this group are not willing to live in low-density areas with easy access. Also, men and women with unhealthy lifestyle are not willing to walk and use public transport, which is expected. Further, these individuals are not family or relative oriented, and generally, men do not care about the environment of their residential location.

The residential location priority of work-oriented men and women is low-density regions. In contrast, Bagley et al. concluded that work oriented individuals prefer to live in high-density regions [22]. Work oriented individuals tend to use public transport and walking (walking safety attitude) and establish familial relations. They also care about the environment of their residential locations. In other words, for citizens who care about their jobs, living in low-density urban regions, walking, visiting relatives, and caring about the environment of their residential locations are important. However, work oriented women care about easy access to their workplaces, but the men in this group are not very willing to live in regions with easy access.

Family oriented men and women are not willing to live in low-density regions; they are interested in spending time and recreation outside the house with their families and friends, care about the safety of

walking, and prefer easy access to different activities. The men in this group, unlike women, are sensitive to the environment of their residential locations. Men with extrovert lifestyle prefer to live in low-density regions, while extrovert women prefer to live in high density regions. Generally, extrovert citizens care less about using public transport, walking, visiting family and relatives, and easy access to residential location. They also disregard the environmental condition around them.

The results of the effect of travel attitude on residential attitude, shown in Table 6, suggest that men and women with public transport-oriented attitude prefer living in low-density regions, using public transport, walking, and are family oriented. They are also sensitive to the environmental characteristics of the residential location (the extent of noise, air pollution, and green space). The public transport-oriented attitude in men causes them to care more about easy access to residential location, while this characteristic is negative in women. In addition, the effect of public transport-oriented attitude of men on their residential attitude is more salient compared with women. This may be due to the importance of this attitude in the broader participation of men compared with women in daily activities.

Citizens with low tolerance to the excessive traffic of peak hours and long duration of trips prefer living in low-density regions with easy access. They do not care about the environmental condition of their residential locations, which is expected. Low tolerance men are more interested in walking and using public transport (more walking safety and proximity to public transport stations), while the women in this group do not share this interest. They generally retract from familial relations.

Evidently, men and women with walking-oriented transport attitude would consider the presence of walking facilities around their residential locations; its salient effect is evident, especially for women, in Table 6. This group of citizens prefers to live in low-density regions; they are family-oriented and have no special tendency for easy access to their residential locations. Further, the environmental condition around their residential locations does not matter to them. The results suggest that the greatest contrast between men and women regarding the effect of travel attitude on land-use around the residential location occurs for those with motorcycle oriented travel attitude (four out of five attitudinal characteristics). Seemingly, the fact that motorcycle is not allowed for women in Iran led to such a result. In any case, women with motorcycle oriented attitude unlike men with such attitude prefer to live in low-density regions. However, they do not prefer the use of public transport and walking and do not care about easy access to residential location

and the environmental condition around it. Motorcycle oriented men and women have family-oriented attitude. The residential locations of individuals who have optimal oriented travel attitude (who want to save costs) do not show any signs of dependence on public transport and walking. Furthermore, they are not family oriented. This group of individuals prefers easy access to residential location, which may originate from the idea of expending less cost through easy access. Optimal oriented women prefer living in low-density regions and care about the environment around their residential location, while men have the opposite preference.

Citizens with attitude that ignores air pollution, just like optimal oriented individuals, do not care about public transport and are not family oriented. Further, the condition around their residential locations does not matter to them. Men who aren't caring for air pollution, expectedly, do not prefer to live in low-density regions and care about easy access to residential location. The attitude of the women in this group is opposite that of men. Among travel attitudes, being vehicle oriented is the only case with similar effect on men and women concerning residential attitude, though the quantitative effects on men and women are different in each case. This attitude has a negative relationship with walking safety attitude, which is absolutely logical result. Vehicle oriented individuals do not prefer easy access and do not care about the environmental condition of their residential locations.

The direct and indirect effects as well as the total effect of the principal factors of attitude (variables) on the choice of personal vehicle as mode of trip are assessed (Table 7). Based on the results, the effect of lifestyle variables shows some differences between men and women. In investigating the total effect, it was observed that family-oriented men and women and individuals who are satisfied with life, prefer outside-the-house recreation (extrovert), and are willing to use personal vehicle. In contrast, being luxury oriented and unhealthy lifestyle of men and women are associated with diminished use of personal vehicle in work trips. The notable point is that the direct effect of unhealthy lifestyle on the use of personal vehicle was not significant in men, while it was positive in women. However, the indirect effects of unhealthy lifestyle eventually led to less use of personal vehicle, which is due to some reasons. Work oriented men use personal vehicle more, while work oriented women employ personal vehicle in work trips less frequently. This indicates a completely opposite view between men and women. While extraversion is directly associated with increased use of personal vehicle, transportation and residential attitudes significantly diminish this effect, such that the total effect of extraversion is negative in men. This highlights the importance of the role of intermediate

variables in investigating the effect of lifestyle variables on the choice of personal vehicle as mode of transport. With regards to travel attitudes, the positive attitudes of men and women towards using public transport and walking have a direct negative relationship with the use of personal vehicle. An interesting result was obtained by evaluating the indirect effect of this attitude on choice of trip, suggesting the importance of the role of land-use in attenuating the role of walking safety attitude in men and women. This means that the residential location can result in increased use of personal vehicle for women due to walking safety attitude.

Low tolerance men and women use personal vehicle more in their work trips. Meanwhile, it was observed that regardless of the effect of intermediate variable of residential attitude in the model, it can be concluded that the direct effect of this factor on personal vehicle choice is more pronounced for women than men. In other words, low tolerance women, compared with similar men, opt for personal vehicle more frequently. However, the total effect of this variable concerning the effect of other variables is closer to each other for men and women. Men with optimal oriented attitude use personal vehicle more, while the opposite applies for women. In other words, men consider the use of personal vehicle as optimal, while for women, alternative means are regarded as optimal. This highlights a fundamentally different attitude in the two genders. In men, disregarding air pollution mostly resulted in increased use of personal vehicle, while it led to diminished use of personal vehicle for women; this may be due to the characteristics of the data taken. Being vehicle oriented in men and women resulted in increased use of personal vehicle in work trips. Interestingly, the indirect effects of residential attitude are trivial compared with the total effect of this variable, suggesting the direct effect of this travel attitude on use of personal vehicle. Therefore, adopting policies that reduce the time of access to public transport and increase the proximity of residential location to workplace and city center by constructing high-rise buildings will naturally have no expectable effect in changing the rate of trips with personal vehicle. The reason is that the direct effect of this variable is far more pronounced than the effect of this variable through residential attitude.

Concerning residential attitude, it was observed that men who prefer to live in low-density regions use personal vehicle more frequently, while this variable has a negative effect for women. A different result was also observed concerning the effect of easy access attitude; in men, this attitude leads to more use of personal vehicle, while the relationship between easy access and personal vehicle usage is negative in women. Investigation of the items of this variable indicates

that the definition of access involves regional access to expressways and workplace as well as local access, such as proximity to shopping centers and public line stations. Possibly, for men, personal vehicle access is more important, while for women, other points of access are important; therefore, the importance of access in women did not lead to more personal vehicle use.

4. Conclusions

The aim of this study is better understanding of the attitudinal differences between men and women in choosing personal vehicle as mode of transport. For this purpose, a survey was conducted through interview in Tehran, capital of Iran. In the survey, travel attitudes, residential attitudes, and lifestyles of citizens were captured through different questions. Further, questions regarding the trip frequency per week and trip mode of the respondents were asked. By applying structural equation modeling, the relationships between attitudes and their association with personal vehicle choice as the mode of trip were studied in men and women. The results are categorized into different parts.

First, evaluation of the effect of lifestyle and travel attitude of individuals on residential attitude indicates that similar attitudes in men and women yield different results in the development of their residential attitudes.

Second, according to the results, the effects of some attitudes on mode choice decision are similar in men and women. Nevertheless, some differences are observed in the signs of the factors and the values of total, indirect and direct effects of attitudes in men and women. As mentioned in the introduction, previous studies suggest that there are fundamental differences in the travel behavior of men and women. Nevertheless, the results of the present study show that these differences originate from the different attitudes of men and women, rather than the relationship between their attitudes and travel behaviors. In other words, observation of the results of factor analysis comparison section between men and women implies fundamental differences in the values of variables such as being public oriented, walking oriented, and vehicle oriented. Although the way these attitudes affect men and women is similar, in practice, the use of personal car as mode of transport is different between men and women.

The results show that person with vehicle oriented attitude use more private car and the gender differences don't have effect on this relationship. On the other side, male with walking-oriented attitude uses car less but female with this attitude uses car more. Although, the women are more tended to use walking as mode of transport but the neighborhood condition and safety of roads may prevent them from walking. Therefore,

the policymaker should consider that the policies for walking promotion does not result in more walking of women.

The results reveal that many transportations attitudes have significant effect on residential attitudes which means, policies for spatial planning and land use factors would not fully achieve their intended results. The vehicle oriented person (men or women) is tending to use car in daily trips and implementing policies about transit oriented development of built environment could not result in desirable decrease of car use.

It is suggested that in future studies, more complex constructs should be used in comparing the process choosing personal vehicle as mode of transport. Considering factors such as socioeconomic variables, satisfaction with trip, and personality traits. Being satisfied with trips taken in a particular mode of transportation may influence attitudes toward and desire for that mode, and thus the likelihood of choosing it in the future.

Furthermore, while this paper deals with work trips, future studies can compare men and women in non-work trips. Non-working trips by car markedly originated from respondent's demand for leisure and entertainment activities rather than routine working trips. Comparing the results of future study could be helpful to identify similarity and differences of attitude effect on car use and could be helpful in making better prediction of travelers response to transportation management policies.

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