Walking Behaviors by Trip Purposes

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Increases in motorized trips and declines in individuals' physical activity have become major challenges for many communities. Many studies have investigated the public health, economic, environmental, transportation, and other benefits of promoting nonmotorized modes of transportation. Studies have suggested a range of policies to be considered by policy makers. A significant portion of the transportation literature is made up of studies that have focused on a single-purpose trip. The present research investigated and compared walking behaviors for a diverse range of trip purposes, including work, study, and shopping trips. A series of behavioral choice models was introduced with a range of explanatory variables, including individual, household, travel, and environmental variables. Of the individual variables, age and gender were found to be significantly related to walking. The results showed that seniors were more likely to walk for work trips. Females were more interested in walking during work and shopping trips; however, females were less active during trips for study purposes. The results showed that individuals who had a car in the household were less motivated to walk for the investigated trip purposes. Time of day was also found to be effective in the decision to walk for various trip purposes. Another significant factor was travel distance, which had diverse effects on walking in all models.

The increase in motorized trips and the decrease in individuals' physical activity have become a major concern for many communities. Recently, this issue has led many local and regional authorities to promote nonmotorized travel, including walking and bicycling in urban areas. Previous studies have mentioned that encouraging people to use active transport can have many health, economic, environmental, transportation, and even social justice advantages (*1–3*).

Many studies have investigated the benefits of promoting nonmotorized modes of transportation and suggested a range of policies to be considered by policy makers. A significant portion of the active transportation literature is made up of studies that have focused on a single-purpose trip and research on various trip purposes remains limited. Among trip purposes, school trips have captured significant attention from the public and academic viewpoints (*1–3*). The reason for this focus is the priority that societies and policy makers give to children. However, some studies have shown that it is important to understand the barriers to walking for different trip purposes so that policy makers can develop strategies to increase the overall use of nonmotorized modes (*4, 5*). This research aimed to investigate and compare walking behaviors for a diverse range of trip purposes, including work, study, and shopping trips.

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LITERATURE REVIEW

The topic of nonmotorized transportation has recently received considerable attention. An individual's decision about walking for various purposes has been found to be affected by a wide range of factors. Previous studies have not all led to consistent results because of varied data sources and methodologies. According to the objectives of this paper, effective factors can be categorized as follows (*a*) individual characteristics, (*b*) household characteristics, (*c*) trip characteristics, and (*d*) environmental factors.

Individual Characteristics

Age and gender were found to be the most correlated characteristics with walking travel behavior. Prior research on the effects of age on traveling to school by active transport has come to different conclusions. Although some studies have found a negative sign for the age variable (*6, 7*), some other studies have found that with an increase in age, the propensity for choosing active modes of transport increases (*8*). There are also some studies that have found no significant relation between age and choosing active modes in trips to school (*3*). In another study, it was indicated that the likelihood of walking declines during high school but with insignificant effect (*2*). The study showed that the effect of age was only significant for children between 5 and 14 years old (elementary and middle school). Rodriguez and Joonwon used data for student and staff commuters to the University of North Carolina in Chapel Hill to illustrate the relationship between mode choice and objectively measured environmental attributes (*9*). Their results showed that students had higher odds of walking or bicycling to campus than staff or faculty members and the higher the number of vehicles available at home for individuals with a driving license, the higher the odds of choosing to drive to campus.

Although some studies on trips to work found higher odds of walking with respect to age (*10*), some others stated the opposite (*9*). Previous research on shopping trips has shown that individuals who go to school are less likely to perform maintenance shopping trips on foot, presumably because they are either too young or cannot afford the time to do so (*4*). However, the results of this study show that children who are between 16 and 17 years old, even if they attend school, make a higher number of walking trips for maintenance shopping than individuals in any other age group. The results of mode choice models from Su and Bell in shopping tours confirm that independent travel is important for older people and that the percentage of trips made by walking does not significantly decrease with age (*11*).

Walking rates are also affected by gender. Many studies on trips to school have found that girls are less likely to walk than boys (*2, 12*), but some studies do not confirm this finding (*7, 3, 13*). Some studies have found that males have a more positive attitude toward walking than females for trips to work (*9, 10*).

Household Characteristics

Prior studies have indicated that opportunities or constraints on household transportation options influence travel behavior. Although in many studies household access to private cars has been reported to have a negative effect on walking and bicycling to school (*7, 14, 15*), some studies have found that the number of cars per driver in the household had no effect on the travel mode choice to school (*1*). A study on nonwork trips found that vehicle ownership had a significantly negative impact on nonmotorized mode usage (*16*). The effect of household interactions in choosing active modes of travel has also been reported in some studies (*2, 15, 17*).

One study found that individuals with fewer vehicles at home had a higher tendency to walk to work relative to those with more vehicles in their households (*9*). In another study, it was found that individuals with low car availability were more likely to walk than individuals with higher car availability for trip purposes including primary job, maintenance shopping, and pure recreation (*4*).

Most previous studies have indicated that households with a lower income level were more likely to choose walking and bicycling for school trips than those with higher income (*3, 1, 18*). The effects of occupation type and length of employment at current employer were examined in another study (*13*). The results showed that job experience (1 to 2 years and > 5 years) was a significant positive predictor of walking to work.

Travel Distance

Many studies have reported that trip distance was the most important factor in the probability of choosing active transportation. Most of the models of nonmotorized travel to school have shown that the probability of choosing active transportation decreased with the increase in trip distance (*1–3, 16*). A distance of 400 m (0.25 mi), which is about a 5-min walk, is often used as an acceptable walking distance in many studies (*19, 20*). However, research has also suggested that walking trips longer than 400 m may not be uncommon (*20, 21*). In addition to the mentioned studies on travel distance, a few studies have been concerned with the relationship between walking distances for a variety of trip purposes (*22, 23*).

Environmental Factors

Recent studies have also explored the relation of active transportation behaviors with environmental factors, such as residential density, street connectivity, or presence of mixed-use activities. Frank et al. incorporated these factors into a single walkability index and examined the relation between the index and individuals' physical activity (*24*). The details and subindex weights of the index have varied across studies. Manaugh and El-Geneidy examined the correlation of walkability scores with household travel behavior and found that walkability indexes are highly correlated with walking trips for most nonwork trip purposes, although sociodemographic characteristics also play a key role (*25*). Manaugh and El-Geneidy found that wealthy, car-owning households were much more sensitive to elements of walkability than retired or low-income households.

Land use diversity within a mile of the trip origin has been found to be a significant environmental factor for nonwork trips (*16*). Land use has an impact on the use of nonmotorized modes at the trip origin end but not at the destination end. Rodríguez and Joonwon, in a study on commuting trips to university, found that the individual's residential density (i.e., the population density measured at the block group of each individual's home location) was statistically insignificant in a mode choice analysis (*9*). Although their results led Rodríguez and Joonwon to the fact that mode choice appeared to be more related to employment densities at destinations than residential densities at origins, the authors mentioned that the block group may not be the appropriate boundary for measuring neighborhood density. In a study that controlled for other variables of influence, mixed land use in a neighborhood also positively affected the likelihood of walking and bicycling to school (*1*).

DATA DESCRIPTION

Area of Study

This study focused on the city of Rasht in Guilan province, Iran (Figure 1). Rasht is the largest city on Iran's Caspian Sea coast, with an area of 180 km^2 and a population of more than 550,000 according to the 2006 Census. Rasht is growing into an industrialized city, mainly because of its closeness to the Caspian Sea and the Port of Anzali.

Over the past decades, especially during the 1970s and 1980s, as in many cities in the country, a surge of rural-urban migration contributed to the emergence of vast squatter settlements around Rasht. These unplanned settlements with disordered pathways, low-quality and condensed houses, and weak infrastructure constitute a major part of the spatial structure in Rasht. Radiating streets from the city center in conjunction with ring roads shape the main structure of the street layout, which gives a significant role to the city center where the traditional bazaar is situated. The situation of the bazaar as the main retail center in the core of the city has caused heavy congestion.

However, over the past decades in Rasht, there has been a change in the spatial pattern of activities. With construction of new streets around the traditional market, diversification of goods and services, and the limited space of the old bazaar, some of the commercial activities have moved outside the traditional bazaar. There has been a gradual superimposition of widened streets, in an attempt to improve accessibility and ease the growing level of car traffic (*26*).

Automobile, taxi, motorcycle, minibus, bus, bicycle, and walking are the major modes of transportation and no mass transit system has been provided yet. The increasing rate of vehicle ownership during the past decade and the poor transit system have made the automobile and taxi the most favored modes of transportation for daily trips. Walking has an overall share of 33%, although the city lacks pedestrian facilities such as dedicated routes for walking and bicycling.

Data

Data for the analysis came from the Rasht comprehensive transportation planning study in 2007. As part of that study, a questionnaire was designed and distributed among more than 5,000 households to collect detailed information about every trip taken by all members of each participating household. Each person was asked to fill out a trip diary for one day, including the mode of travel, starting and ending times for each trip, and the trip purpose. Household information, including number of vehicles owned and household size,

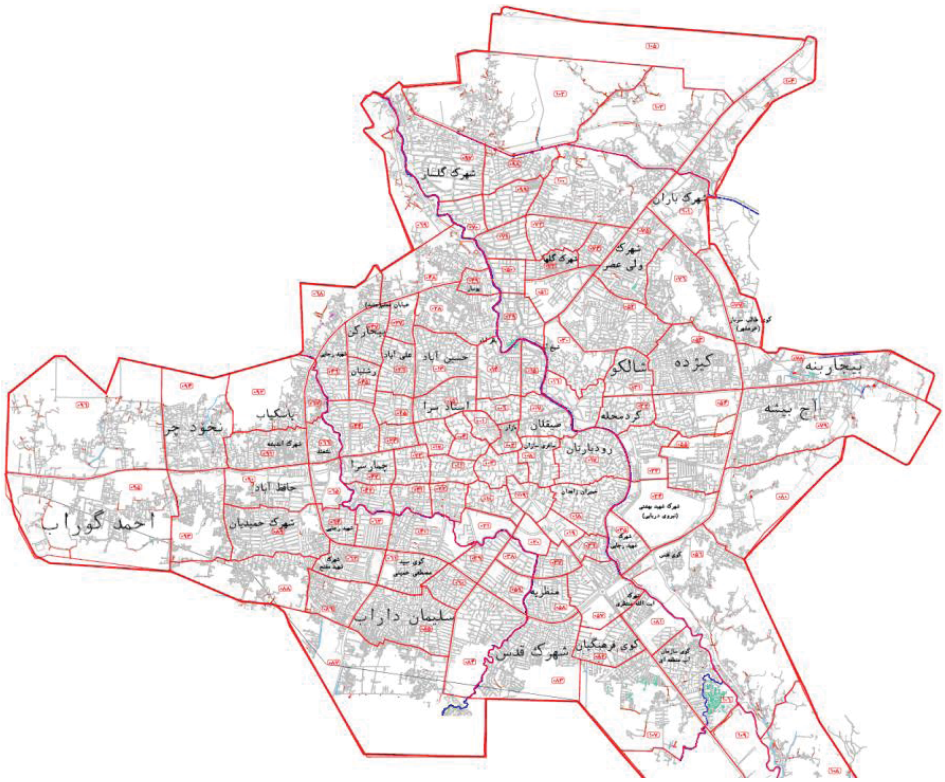

FIGURE 1 City of Rasht, with 112 traffic analysis zones.

and individual sociodemographic information such as age, gender, and job status were also collected. The survey was collected by contractors to the Rasht municipality.

Since the research objective was to assess the travel behavior of individuals traveling in urban areas (containing 112 traffic analysis zones), trips that had origins or destinations located outside the municipal boundaries of Rasht were excluded. Furthermore, a few observations were eliminated because of incompatibilities that were found. The study obtained data on more than 31,000 trips that were reported for 10 trip purposes in the traffic analysis zones. Of all the trips made, more than 15,000 trips were return to home (about 49% of the total); 5,500 were to work (more than 17.54% of the total); 5,410 were for the purpose of study, including trips to school and university (15.6%); 2,737 were for shopping (8.7%); and 1,108 were for meeting family, relatives, and friends (3.5%). The overall walk and nonwalk shares for various trip purposes are summarized in Table 1.

METHODOLOGY

A binary logit model was developed based on disaggregate data for three trip purposes (work, study, and shopping) made by residents of Rasht. Trips for study included trips to school and university. There were two levels for the response variable: 1 if the trip was taken by foot and 0 if it was taken by other modes of transport. Bicycle trips were not considered separately but were pooled with other nonwalk modes.

The explanatory variables were divided into four main categories: individual characteristics, household characteristics, travel characteristics, and environmental factors. Individual factors included characteristics of the trip maker, such as age, gender, and job status. These characteristics would help to determine the differences in systematic utilities between active modes and other choices for travel. To examine the effect of an individual's age, age groups were defined and tested in the models. Individuals between 7 and

TABLE 1 Distribution of Walk and Nonwalk Shares Across Trip Purposes

	Distribution by Trip Purpose (%)					
Mode	Work	Study	Shopping	Home	Other	All Purposes
Walk	18.96	37.60	49.25	33.88	38.47	33.61
Nonwalk	81.04	62.40	50.75	66.12	61.53	66.39
Total	100.0	100.0	100.0	100.0	100.0	100.0

18 years old were divided into three groups, 7 to 11, 12 to 15, and 16 to 18, to represent elementary, middle, and high school students, respectively. After multiple models were developed for the trip purposes, the group 31 to 60 years old was defined because similarities were found in the travel behavior of individuals in this age range. Individuals older than 60 years were categorized in a separate group.

Household factors included characteristics of the family of the trip maker, such as number of persons in the family, vehicle ownership, and number of children. Transportation, infrastructure, and environmental factors were limited because of lack of data. A major limitation to this research was the lack of information about actual distance traveled. Home location data were collected in the comprehensive transportation planning study of Rasht (*27*); however, unfortunately, those data could not be accessed for this study. To examine the effect of travel distance, the distance on the transportation network between the traffic analysis zone centroids of origin and the destination of the trip was taken as the trip distance. Seven categories were defined for trip distance, with trips less than 0.25 mi as the reference level (Table 2). The aim was to find out the relative amount of disutility of distance intervals for the trip purposes.

The statistical analysis required coding and preparing the data to transform contributing factors into useful independent variables for the modeling process. Coding definitions, which were specifically developed for each of the variables, are given in Table 2. The average and standard deviation of the variables used in the final models are reported in Table 3.

DISCUSSION

Binary logit models were estimated for three trip purposes. The best specifications for the three models were obtained after systematic elimination of the statistically insignificant variables. Table 4 summarizes the results for the developed binary logit models. The results confirmed many of the findings in the existing literature. The rest of this section is devoted to the discussion of the findings.

Demographic Characteristics

Age

In work trips, individuals over 60 years old (seniors) were compared with other groups. The results showed that seniors were more willing to walk, which may have been because of their inability to drive and positive attitudes toward walking to maintain their physical fitness.

The groups 19 to 30 years old and over 60 years old appeared with a negative sign in the shopping models. However, because the effect was not statistically significant, these age groups were eliminated from the final model. Elementary and middle school children (children aged 7 to 11 years and 12 to 15 years) were found to have a significant positive sign in the shopping model. One of the reasons behind this finding may have been a sociocultural factor in Rasht in which parents often request their younger children to buy small home needs (e.g., groceries) from adjacent retail shops.

TABLE 2 Descriptions of Examined Variables

Category	Variable	Definition
Individual Characteristics		
Gender	Gender	1 if female; 0 if male
Age	Age_7–11	1 if age is between 7 and 11; 0 otherwise
	Age_12–14	1 if age is between 12 and 14; 0 otherwise
	Age_15–18	1 if age is between 15 and 18; 0 otherwise
	Age_19–30	1 if age is between 19 and 30; 0 otherwise
	Age_31–60	1 if age is between 31 and 60; 0 otherwise
	Age_O60	1 if age older than 60 years; 0 otherwise
Household Characteristics		
Structure	Child_U7	1 if there is a child younger than 7 years in household; 0 otherwise
	Child_7–11	1 if there is a child between 7 and 11 years in household; 0 otherwise
	Child_12–18	1 if there is a child between 12 and 18 years in household; 0 otherwise
	Veh_Motor	Number of motorcycles in household
Vehicle ownership	Veh_Auto	1 if there is an automobile in household; 0 otherwise
Trip Characteristics		
Travel distance	Dist_r (ref. level)	1 if trip distance is less than 0.25 mi; 0 otherwise
	Dist_0.25–0.50	1 if trip distance is between 0.25 and 0.5 mi; 0 otherwise
	Dist_0.50–0.75	1 if trip distance is between 0.5 and 0.75 mi; 0 otherwise
	Dist_0.75–1.00	1 if trip distance is between 0.75 and 1.0 mi; 0 otherwise
	Dist_1.00–1.50	1 if trip distance is between 1.0 and 1.50 mi; 0 otherwise
	Dist_1.50–2.00	1 if trip distance is between 1.50 and 2.0 mi; 0 otherwise
	Dist_Ov2.00	1 if trip distance is over 2.0 mi; 0 otherwise
Time of travel	Time_Hour	Dummy variables indicating different time periods of day
Environmental Characteristics		
Population density	PopDen_O	Population per square kilometer of trips origin zone
Trip inside CBD	PopDen_D	Population per square kilometer of trips destination zone
	CBDTrip_OD	1 if trip origin and destination is inside CBD; 0 otherwise

NOTE: CBD = central business district.

TABLE 3 Averages and Variances of Variables Used in Final Model

	Trip Purpose					
	Work		Study		Shopping	
Variable	Average	SD	Average	SD	Average	SD
Gender	.120160	.325178	.428513	.494914	.683961	.465013
Age_7–11	—	—	—	—	.186335 E–01	.135252
Age_12–14	—	—	—	—	.354403 E–01	.184924
Age_19–30	—	—	.109273	.312013	—	—
Age_O60	.212689 E–01	.144292	—	—	—	—
Child_7–11	.298309	.457558	—	—	—	—
Veh_Motor	.151245	.391306	—	—	.137377	.394751
Veh_Auto	.563716	.495969	.548407	.497702	.521008	.499650
Dist_0.25–0.50	—	—	.240605	.427494	—	—
Dist_0.50–0.75	.108889	.311529	.151348	.358424	.114724	.318747
Dist_0.75–1.00	.881658E-01	.283562	.110090	.313034	.796493 E–01	.270799
Dist_1.00–1.50	.178695	.383131	.180556	.384689	.136646	.343536
Dist_1.50–2.00	.136884	.343756	.104371	.305772	.145049	.352215
Dist_Ov2.00	.258317	.437749	.173611	.378813	.143588	.350735
Time_8–10	.217779	.412774	—	—	—	—
Time_11–12	—	—	.103145	.304180	.949945 E–02	.970188 E–01
Time_15–17	.134157	.340852	—	—	—	—

NOTE: SD = standard deviation; — = variable was not used in final models presented.

TABLE 4 Binary Logit Models by Trip Purpose

	Trip Purpose					
	Work		Study		Shopping	
Variable	Coefficient	*t*-Statistic	Coefficient	*t*-Statistic	Coefficient	*t*-Statistic
Constant	.56189***	5.93	1.87402***	9.43	1.67073***	11.67
Gender	.54387***	4.56	–.35052***	–4.72	.91882***	7.31
Age_7–11	—	—	—	—	2.07301***	4.03
Age_12–14	—	—	—	—	1.70617***	4.45
Age_19–30	—	—	–.98238***	–5.37	—	—
Age_O60	.92640***	3.83	—	—	—	—
Child_7–11	–.17606*	–1.91	—	—	—	—
Veh_Motor	–.69151***	–5.84	—	—	–.46506***	–3.15
Veh_Auto	–1.32156***	–15.34	–.28713***	–3.94	–.48332***	–4.27
Dist_0.25–0.50	—	—	–.62851***	–3.12	—	—
Dist_0.50–0.75	–.82761***	–7.39	–1.43016***	–6.99	–1.44236***	–1.44236
Dist_0.75–1.00	–1.38729***	–10.42	–2.22094***	–10.48	–2.39718***	–2.39718
Dist_1.00–1.50	–2.68725***	–18.64	–3.04521***	–14.53	–3.24510***	–3.24510
Dist_1.50–2.00	–3.10868***	–16.63	–3.82012***	–15.65	–4.87181***	–4.87181
Dist_Ov2.00	–3.63747***	–20.82	–4.62535***	–17.42	–5.01356***	–5.01356
Time_8–10	.39570***	4.04	—	—	—	—
Time_11–12	—	—	.44029***	3.88	–1.11992**	–1.11992
Time_15–17	.43055***	3.76	—	—	—	—

NOTE: Number of observations: work = 5,501; study = 4,896; shopping = 2,737. Log likelihood at zero: work = –2,671.53417; study = –3,241.55685; shopping = –1,896.83673. Log likelihood at convergence: work = –1,890.88151; study = –2,311.13686; shopping = –1,051.01751. McFadden pseudo-R^2: work = .2922114; study = .2870287; shopping = .4459104. χ^2: work = 1,561.30532;
study = 1,860.83999; shopping = 1,691.63845.
*Significant at 10% level; **significant at 5% level; ***significant at 1% level.

The results on study trips showed that individuals aged 19 to 30 years were less likely to walk relative to other groups. This group included university students who had reached the legal age limit (18) for a driving license. Therefore, it was reasonable that this variable had a negative sign in the model.

Gender

In accordance with previous studies, it was found that walking is affected by the individual's gender (*2, 9, 10*). Table 4 shows that females were more likely to walk than males for shopping and work trips. The results for study trips were consistent with some studies indicating that girls are less likely to walk than boys (*2*).

The differences between males and females in choosing walking for various trip purposes may have been caused by sociocultural factors. One of these factors may have been related to the individual's age, in that there may be more parental concerns about younger girls than boys. Therefore, girls are accompanied to school more often. By contrast, older females have more independence and freedom. The results were consistent with another study on school trips, which found that girls were less likely to walk than boys, with the difference being more significant at younger ages (*1*). Another reason behind the gender difference may have been the fact that females view shopping and working trips as an opportunity to socialize. This possibility was especially evident in shopping trips, where many housewives may consider the shopping trip as a recreational outing.

Household Characteristics

The availability of a car in the household was another significant variable in all models, showing that individuals with a car available were less motivated to walk for various trip purposes. As indicated in Table 4, car ownership especially decreases the probability of walking to work. Although there was no information on the number of licensed drivers in the household, the model results were consistent with previous studies on various trip purposes (*4, 9, 15, 16*).

A higher number of motorcycles in the household also deterred the individual's tendency to walk for work and shopping purposes. This finding was expected because household members had access to an additional transportation option. But the finding was particularly unique, since no previous studies have examined the effect of motorcycle ownership on walking trips. This variable was found statistically insignificant in the study trip models.

Household Interactions

Analyses of travel have suggested that the presence of children has an effect on adults' travel patterns. The results of this study showed that having elementary school–age children in the household (children aged 7 to 11 years) decreased the likelihood of walking to work. The reason behind this may have been that families feel more responsibility for their younger children and thus the interaction between the children's trip to school and the parent's trip to the workplace led families to choose motorized transportation modes (usually driving) for accompanying children to school and then going to their workplaces. These findings have also been reported in the literature (*2, 17*).

The results obtained showed that making trips to work from 8:00 to 10:00 a.m. and from 3:00 to 5:00 p.m., periods of almost no school trips, had a significant positive effect on the propensity to walk in comparison with other times of day. This finding further confirmed the discussion about the effect of children's school trips on the trip patterns of adults. In addition, the positive effect of making a work trip during the mentioned hours may have been caused by the fact that individuals who make trips to work during 8:00 to 10:00 a.m. and 3:00 to 5:00 p.m. may not be as time constrained as others, especially those who go to work in the morning. The starting time for office employees in Rasht is usually between 7:30 and 8:00 a.m. So it was concluded that individuals whose jobs were less time constrained (e.g., tradesmen) tended to walk more than individuals in other occupational groups on their way to the workplace. This was an interesting result that should be investigated further in future studies. Other studies have reported lack of time as a significant barrier to walking (*13*).

The presence of school-age children in the household had no significant impact on walking for shopping or school trips. The propensity to walk increased when the trips were made between 11:00 a.m. and noon for the purpose of study relative to other times of day. Some schools in Rasht had more than one period (usually one period in the morning and another period in the afternoon). This finding was consistent with the previous findings and was also in line with another study that found that having a school within walking distance did not reduce demand for escorting in the morning, although it did in the afternoon (*28*). The mentioned period (11:00 a.m. to noon) has also been reported as the noon peak hour time in the Rasht traffic network. The propensity to walk for shopping also decreased during the noon peak hour. This finding was consistent with other studies that have reported traffic congestion as a barrier to walking (*13*).

Travel Distance

Travel distance was categorized in six levels relative to a base category (i.e., distances less than 0.25 mi). So it was logical to find that the estimated coefficients had negative signs in the models. In general, the results for the various trip purposes were consistent with the results of other studies that have shown that an increase in trip distance decreases the likelihood of walking (*1–3, 16*). As shown in Table 4, different coefficient values were determined for the assumed distance intervals. This finding confirmed the appropriateness of breaking the distance variable into several intervals. The estimated coefficients are plotted in Figure 2 to show the variation of the effect of distance for different trip purposes. As can be seen in Figure 2, although the variation in the distance coefficients for the study trips is approximately linear, some nonlinear effects can be seen for work and shopping trips.

Compared with work trips, the unwillingness to walk is more pronounced in study and shopping trips. From the presented models, the greater negative coefficients of walking distance for shopping trips may be related to difficulties in carrying heavy goods, which is in line with a study by Mackett (*29*).

The results also showed that all distance categories were significantly different with respect to the reference level (i.e., less than 0.25 mi) except the first category (i.e., 0.25 to 0.5 mi) in the work and shopping models. This finding implied that the acceptable walking distance for the purpose of study was 0.25 mi (400 m) but it was 0.5 mi for work and shopping trips. In other words, although people do not care so much about walking up to 0.5 mi (800 m) for work and

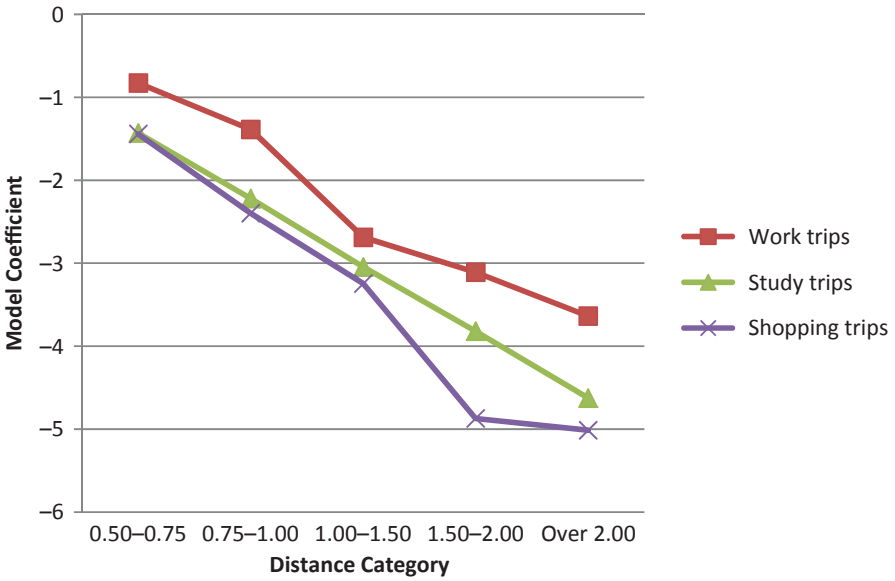

FIGURE 2 Effects of distance categories on propensity to walk for work, study, and shopping.

shopping trips, people were sensitive to trips that were longer than 0.25 mi for the purpose of study.

Environmental Characteristics

Access to environmental information was limited in this study. However to examine the possible relations, some variables were created with the existing data. The created variables were population density of trip origin zone, population density of trip destination zone, and a variable for trips inside the central business district. But since the created variables were not significant in the final models, the variables were eliminated.

CONCLUSION

The purpose of a trip has been found to be a crucial determinant of travel mode choice in recent studies. In this study, models were presented for walking behavior for three trip purposes: work, study, and shopping. Comparisons of the coefficients between various trip purposes provided useful insights about the behavior of travelers. This research was the first study to consider walking as a mode of transport in the city of Rasht, the regional capital of Guilan province, Iran. Despite the limitations in the study, several variables were created and examined in multiple behavioral models.

The findings showed that females were more likely to walk than males for shopping and work trips, but females were less likely to walk for study trips. The differences in choosing walking for various trip purposes were addressed with sociocultural factors. It was concluded that there may have been more parental concern about younger females during trips to school. From the results discussed, it can be concluded that the interaction of children's study trips and parents' work trips in the morning may potentially decrease the propensity to walk for both groups. Car availability in the household was another negative factor on walking for various trip purposes.

The results obtained showed that making trips to work during 8:00 to 10:00 a.m. and 3:00 to 5:00 p.m. had a significant positive effect on the propensity to walk in comparison with making such trips at other times of day. It was concluded that individuals whose jobs were less time constrained (e.g., tradesmen) tended to walk more than other occupational groups on their way to the workplace. This finding was an interesting result that should be investigated further in future studies.

It was also found that trips that were longer than 0.5 mi (400 m) decreased the probability of walking, with the effects being greater for shopping and study trips. However, a major limitation of this research was the lack of information about the actual distance traveled, which should be considered in future research.

Some other limitations are important to point out. Household income was not gathered in the data collection stage. In addition, access to environmental data was limited in this study, although an emerging body of literature suggests that pedestrian and bicycle modes are sensitive to characteristics of the built environment. Additional research examining the reciprocal influence between individual walking behaviors for various trip purposes could further clarify the relationships detected in this study.

REFERENCES

1. McMillan, T. The Relative Influence of Urban Form on a Child's Travel Mode to School. *Transportation Research Part A,* Vol. 41, 2007, pp. 69–79.
2. McDonald, N. C. Household Interactions and Children's School Travel: The Effect of Parental Work Patterns on Walking and Biking to School. *Journal of Transport Geography,* Vol. 16, 2008, pp. 324–331.
3. Ermagun, A., and A. Samimi. Active Transportation Mode Choice Behavior Across Genders in School Trips. Presented at 91st Annual Meeting of the Transportation Research Board, Washington, D.C., 2012.
4. Bhat, C. R., J. Y. Guo, and R. Sardes. Non-Motorized Travel in The San Francisco Bay Area. Department of Civil Engineering, University of Texas at Austin, 2005.
5. Humpel, N., N. Owen, D. Iverson, E. Leslie, and A. Bauman. Perceived Environment Attributes, Residential Location, and Walking for

Particular Purposes. *American Journal of Preventive Medicine,* Vol. 26, 2004, pp. 119–125.
6. McDonald, N. Critical Factors for Active Transportation to School Among Low-Income and Minority Students: Evidence from the 2001 National Household Travel Survey. *American Journal of Preventive Medicine,* Vol. 34, 2008, pp. 341–344.
7. Wilson, J. E., J. Marshall, R. Wilson, and J. K. Krizek. By Foot, Bus, or Car: Children's School Travel and School Choice Policy. *Environment and Planning A,* Vol. 42, No. 9, 2010, pp. 2168–2185.
8. Yeung, J., W. Scott, and P. H. Andrew. Child Transport Practices and Perceived Barriers in Active Commuting to School. *Transportation Research Part A,* Vol. 42, No. 6, 2008, pp. 895–900.
9. Rodríguez, D. A., and J. Joonwon. The Relationship Between Non-Motorized Mode Choice and the Local Physical Environment. *Transportation Research Part D,* Vol. 9, No. 2, 2004, pp. 151–173.
10. Teshome, M. Logit Model of Work Trip Mode Choice For Bole Sub-City Residents. MS thesis. University School of Graduate Studies, Addis Ababa, Ethiopia, 2007.
11. Su, F., and M. G. H. Bell. Transport for Older People: Characteristics and Solutions. *Research in Transportation Economics,* Vol. 25, 2009, pp. 46–55.
12. McMillan, T., K. Day, M. Boarnet, M. Alfonzo, and C. Anderson. Johnny Walks to School—Does Jane? Sex Differences in Children's Active Travel to School. *Children, Youth and Environments,* Vol. 16, 2006, pp. 75–89.
13. Bopp, M., A. T. Kaczynski, and G. Besenyi. Active Commuting Influences Among Adults. *Journal of Preventive Medicine,* Vol. 54, 2012, pp. 237–241.
14. Copperman, R., and C. Bhat. An Analysis of the Determinants of Children's Weekend Physical Activity Participation. *Transportation,* Vol. 34, 2007, pp. 67–87.
15. Park, H., R. B. Noland, and U. Lachapelle. Active School Trips: Associations with Caregiver Walking Frequency. *Transport Policy,* Vol. 29, 2013, pp. 23–28.
16. Cervero, R., and M. Duncan. Walking, Bicycling, and Urban Landscapes: Evidence from the San Francisco Bay Area. *American Journal of Public Health,* Vol. 93, No. 9, 2003, pp. 1478–1483.
17. Yarlagadda, A. K., and S. Srinivasan. Modeling Children's School Travel Mode and Parental Escort Decisions. *Transportation,* Vol. 35, No. 2, 2007, pp. 201–218.
18. Spallek, M., C. Turner, A. Spinks, and C. Bain. Walking to School: Distribution by Age, Sex, and Socioeconomic Status. *Health Promotion Journal of Australia,* Vol. 27, 2006, pp. 134–138.
19. Krizek, K. Neighborhood Services, Trip Purpose, and Tour-Based Travel. *Transportation,* Vol. 30, No. 4, 2003, pp. 387–410.
20. McCormack, G., B. Giles-Corti, and M. Bulsara. The Relationship Between Destination Proximity, Destination Mix and Physical Activity Behaviors. *Journal of Preventive Medicine,* Vol. 46, No. 1, 2008, pp. 33–40.
21. Hoehner, C., L. Brennan Ramirez, and M. Elliot. Perceived and Objective Environmental Measures and Physical Activity Among Urban Adults. *American Journal of Preventive Medicine,* Vol. 28, 2005, pp. 105–16.
22. Yang, Y., and A. V. Diez-Roux. Walking Distance by Trip Purpose and Population Subgroups. *American Journal of Preventive Medicine,* Vol. 43, No. 1, 2012, pp. 11–19.
23. Millward, H., J. Spinney, and D. Scott. Active-Transport Walking Behavior: Destinations, Durations, Distances. *Journal of Transport Geography,* Vol. 28, 2013, pp. 101–110.
24. Frank, L. D., T. L. Schmid, J. F. Sallis, J. Chapman, and B. E. Saelens. Linking Objectively Measured Physical Activity with Objectively Measured Urban Form—Findings from Smartraq. *American Journal of Preventive Medicine,* Vol. 28, No. 2, 2005, pp. 117–125.
25. Manaugh, K., and A. El-Geneidy. Validating Walkability Indices: How Do Different Households Respond to the Walkability of Their Neighbourhood? *Transportation Research Part D,* Vol. 16, No. 4, 2011, pp. 309–315.
26. Azimi, N. Restructuring Urban Morphology: A Case Study of Rasht, Iran. *Researches in Geography,* No. 53, 2005, pp. 13–25.
27. *Rasht Comprehensive Transportation Study.* Final report. Municipality of Rasht, Iran, 2011.
28. Vovsha, P., and E. Petersen. Escorting Children to School: Statistical Analysis and Applied Modeling Approach. In *Transportation Research Record: Journal of the Transportation Research Board, No. 1921,* Transportation Research Board of the National Academies, Washington, D.C., 2005, pp. 131–140.
29. Mackett, R. L. Why Do People Use Their Cars for Short Trips? *Transportation,* Vol. 30, No. 3, 2003, pp. 329–349.

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