
WALKING TO LOCAL DESTINATIONS; PERCEIVED VERSUS ACTUAL DISTANCE

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Abstract

Walking is regarded as the easiest and simplest positive change that can be made to improve human health indirectly. As the most common form of physical activity, walking may be encouraged by opportunities for utilitarian walking, as those who live in areas with higher accessibility to local destinations are more likely to walk longer distances. However, the critical question is that how close destinations need to be for residents to know they are located and consequently walk to them. It is assumed that individual's perception of walking distance to destinations is different from the actual distance and the difference is dependent on the type of destination, walking experience level as well as the socio-demographic profile of the individual. In this regard, this study attempted to find out the discrepancy between perceived and actual distances and its' association with personal characteristics/habits for a sample of residents (n= 237) lived in Metropolitan Shiraz, Southwest Iran in late 2013. The comparative analysis of data collected through questionnaire survey showed that irrespective of gender, the longer distances the residents walked; the more accurate they estimated the distance they had walked. Different age groups differed in their estimations of distances to facilities. Interestingly, elders were better able to estimate the distance to their daily routine destinations; however, younger adults were able to estimate the distance to recreational facilities more precisely. The result also showed the more satisfied the residents were with their neighborhood, the more correctly they could estimate the distances of different places in the neighborhood. As an implication of this study, it is crucial for urban planners to watch and be aware of how residents perceive their neighbourhood area in order to increase physical activity/walking level through decreasing the perceived distance to local destinations.

Keywords: Neighborhood, Perceived and Actual Distance, Walking, Shiraz

1. INTRODUCTION

Accessibility to local facilities can improve the perception of environment and encourage residence to walk to their destinations. Therefore, a well-designed neighborhood can encourage residents to walk to their destinations. Therefore, land use planning and regulations play an important role in providing a

neighborhood with good accessibility to local destinations, so, planners should consider accessibility as an appropriate parameter to encourage residents to walk to their destinations.

Researchers have recently become interested in the factors that may affect on residents' perceived distance to local destinations. However, there is little consistency on the role of personal and social factors on perceived distance to facilities. Macintyre et al. (2008) suggested doing more qualitative studies on the socio-economic and individual characteristics affecting people's judgment of distance. Deeper investigation is required to understand how personal and social factors interact with environmental factors, and how the improvement of environment awareness can improve their use of utilities (Maddison et al., 2010).

The perceived distance to different facilities at neighborhood level may be affected by many factors, and in turn, perceived and actual proximity to destinations may affect resident's walking habit. Madison et al. (2010) have examined the connection between perceived and actual distances to local facilities among New Zealand adolescents. They analyzed the distance high school students walked to their intended facilities and compared the actual and perceived distance to those facilities. Closer destinations were associated with higher use of some facilities. Furthermore, the agreement between perceived and actual distances was fairly poor among adolescents.

A study by Mc Cormack et al. (2008) revealed that destinations closer to home were overestimated; in contrast, further away destinations were underestimated. Therefore, perceived distance cannot consistently reflect the actual distance. Their findings also showed that both actual and perceived distances affected the physical activity behavior.

Humpel et al. (2004) found that environmental factors were associated with different levels of walking. Interestingly men and women behave differently. However, the approaches to increasing physical activities should focus on attributes of the local environment, influencing particular subsets of walking behavior. Scott et al. (2007) compared perceived and objectively measured access to recreational facilities with the aim of predicting the amount of physical activity in adolescent girls.

The results proved that either individual facility perception or the total number of perceived facilities were associated with the increased physical activity. Kirtland et al. (2003) carried out a study in Sumter County, South Carolina to find association between perception of environmental factors at neighborhood level and physical activity by comparing their response with objective measures.

The results showed existing a correlation between physical activity level and having access to recreational facilities while people with lower activity level demonstrated greater agreement with safety of recreation facilities.

They concluded that distance to facilities and behavioral patterns may explain differences that existed in perceptions at neighborhood level.

A study by Foster et al. (2004) on the relationship between environmental perception and the amount of walking among British adults found that the amount of walking for women was related to safety while for men, walking was related to having the open space accessible in their neighborhood. According to Macintyre et al. (2008), based on the experience of Glasgow residents, self-reported distance to facilities may not accurately reflect a real distance.

A study by Corti and Donovan (2002) among Australian adults showed that the quality of walking environment may have an effect on amount of walking, though residents in low socio-economic status areas were less likely to walk around compared to those who lived in high socio-economic status areas.

Tilt et al. (2007) showed that different objective and subjective accessibilities in different neighborhoods are correlated with different amount of walking and Body Mass Index (BMI). In addition, perceived environment may influence the amount of walking and physical activity.

A review by Hample et al. (2002) of the literature on the connection between physical activity and environmental factors concluded that accessibility and aesthetic attributes had significant correlation with physical activity. Hoehner et al. (2005) showed that cycling and walking for both transportation and recreation goals were correlated with different perceived and actual environmental characteristics. Carnegie et al. (2002) found that accessibility and environmental attractiveness influence residents physical activities and walking. The same was resulted in a study by Duncan and Mummery (2005): the physical activity was related to aesthetic and safety, whereas proximity to footpaths influenced the walking.

2. RESEARCH METHODOLOGY AND DATA

This study aimed to investigate the difference between actual and perceived distance to local facilities, and the role of neighbourhood planning in affecting the level of walking.

Hemmat neighborhood in Shiraz, Southwest of Iran was chosen as the case study area (Fig. 1). Shiraz is fifth largest city of Iran with a population over 1.5 million (Soltani and Hoseini, 2014). The neighborhood is occupied with middle class group who are mostly government employers.



FIGURE1 - HEMMAT NEIGHBORHOOD OF SHIRAZ

A self-report questionnaire was used to estimate the resident's perceived distance to the target destinations. This was compared with the actual distance calculated by Geographic Information System (GIS) through Network Analyst Extension, ESRI ArcGIS, version 10.2.

Data on socio-economic characteristics, respondents' perception of environment, amount of walking and their perception of distances to specific facilities all were collected through a questionnaire survey undertaken on late 2013 within seven days.

Three types of variables were considered: socioeconomic variables, perceived environmental variables and the amount of time spent on walking. The socioeconomic variables included: age, gender, family income, and number of children in the household, residence record, family type and education. Environmental variables included two subcategories: the first category was related to variables which

show respondents' attitude toward crime, aesthetics and satisfaction with their neighborhood. The second category was the perceived distance between nearest target destination to their home such as destination to grocery, bakery, butchery, post office, library, kindergarten, primary school, secondary school, bus stops, taxi station, park, Swimming pool, gym and soccer field. Participants were asked to indicate the time (in minute) that would take them to walk from home to the nearest destinations. On the other hand, actual distances to each land use from respondents' home were calculated by GIS. Then the average walking speed of four kilometer per hour was used to estimate the time taken to reach to mentioned destinations.

The population of Hemmat neighborhood was 6'983 including 5'282 adults (15-65 years old). From 371 questionnaires posted to the households, 237 questionnaires (about 62.5 percent) were returned corrected. The average age of respondents was 46.6 years. 42.7 percent of respondents were female. The average monthly household income was reported around 500US dollars. Each household owned 1.03 cars and 1.4 children in average.

The average floor area of residence was reported 167 square meters per household. Around seven percent of individuals participated in the questionnaire survey had reported having primary education, 51 percent secondary, 38 percent undergraduate university degrees and 5 percent postgraduate degrees. In addition, three percent of participants were adults living alone, 34 percent lived with their parents, 10 percent lived with their partner and 53 of the respondents were as parents living with children. Around 66 percent of sampled households lived in single-family house and 34 percent in apartments.

3. ANALYSIS

According to the survey result, the most correctly answered questions of perceived distances were related to daily needs such as grocery, bakery, bus stop, taxi stop and park. On the other hand, the specific land uses such as soccer field, gym and swimming pool have received less accurate estimation of location by sampled individuals.

As shown in Fig. 2, the responses to daily regular destinations were overestimated, while the distances to specific destinations were underestimated.

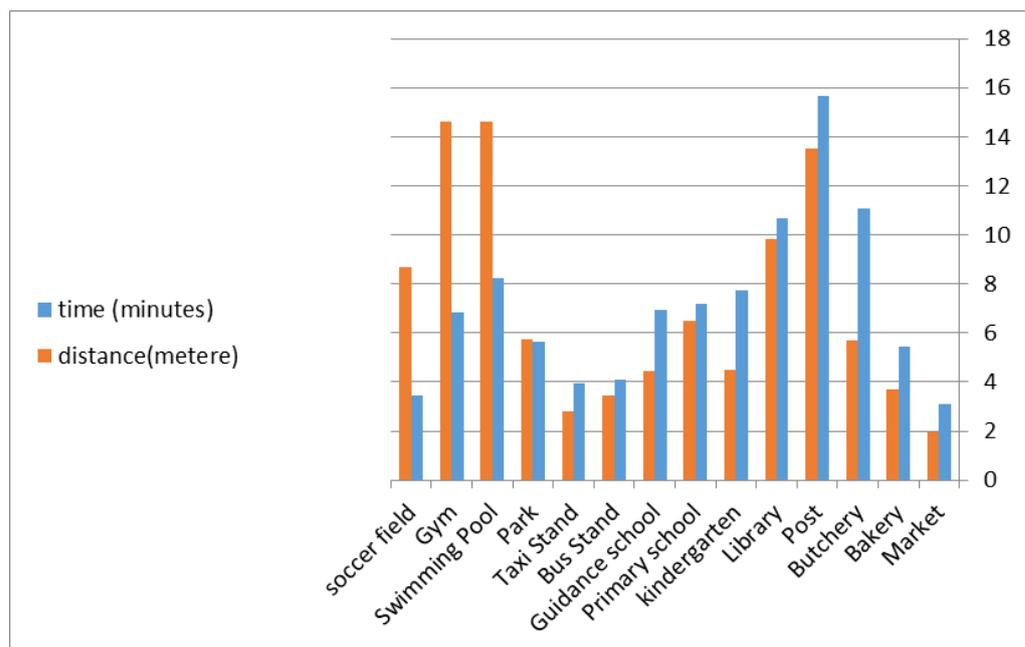


FIGURE 2 -THE PERCENTAGE OF ANSWERED QUESTIONS TO EACH DESTINATION

The most accurate estimation case was related to park location. This might be a result of either good understanding of the distance to the park since it was used more than other facilities, or existence of having only one park located at local area.

Some statistical methods including correlation analysis, t-test and analysis of variance (ANOVA) were used to have a comparative description of different individuals in estimating distance to local facilities (Table 1). The Pearson bi-variate correlation analysis was used to find any agreement between actual and perceived distances to local destinations. The correlation coefficient for distance to grocery, bakery, library, bus stop, taxi stop, park and swimming pool were significant at the 0.01 level. The results for nearest post office, secondary school and gym were significant at the 0.05 level. Also, the correlation between actual and perceived distance to nearest butchery and soccer field was significant at the 0.1 level. On the other hand, there was no significant correlation between perceived and actual distances to nearest kindergarten and primary schools. Two possible answers for this lack of agreement between actual and perceived distance can be mentioned. Firstly, parents might be taking their child to their preferred primary school and kindergarten rather than the nearest ones. In addition, the lack of agreement might be due to the fact that participants have no child (89.7 percent) and lack of using these facilities might have resulted in misjudgment of distance to these facilities.

The statistical t-test was conducted to investigate whether there is a significant difference between men and women regarding the perceived distance to destination. The analysis showed that there was no significant difference between men and women in terms of perceived distance to facilities. On the other

hand, a significant difference about respondents' satisfaction with neighborhood was appeared between two genders ($t=2.2$, $p<0.03$), (Table 4). In order to find the relationship between age and perceived distance to destination, the Pearson correlation test was used. A significant positive association was found between age and perceived distances to closest grocery ($r=0.205$, $p<0.002$), butchery ($r=0.161$, $p<0.014$), post office ($r=0.169$, $p<0.01$), bus stop ($r=0.217$, $p<0.001$) and taxi stop ($r=0.215$, $p<0.001$). Interestingly, a significant negative association was found between perceived distance to soccer field and age ($r=-0.117$, $p<0.075$). Also, positive significant relationships with grocery ($r=0.0211$, $p<0.001$), butchery ($r=0.154$, $p<0.019$), post office ($r=0.165$, $p<0.012$), secondary school ($r=0.157$, $p<0.053$), bus stop ($r=0.314$, $p<0.000$) and taxi stop ($r=0.332$, $p<0.000$) appeared. No significant correlation between family income and perceived distance to destination was.

In order to deeply examine the relationship between age and perceived distances, participants were divided into four categories including: a) 15-24 year old, b) 24-45 year old, c) 45-65 year old and d) 65 year old and further. The percentage for categories was 27.6, 36.2, 32.3 and 3.9 respectively. The one way ANOVA was applied to extract the most significant multi-state variables of the different age groups. The results indicated that there was a significant difference among age groups in terms of perceived distances to grocery ($F=4.56$, $p<0.004$), butchery ($F=3.59$, $p<0.014$), post office ($F=2.96$, $p<0.033$), bus stop ($F=4.82$, $p<0.003$) and taxi station ($F=5.38$, $p<0.001$). Also the Tukey HSD test was applied to indicate the sub-group caused the differences. For both perceived distances to grocery and butchery, the category of more than 65 year old showed a significant difference with other groups. Regarding the perceived distance to the post office, the group of 65 year and elder was different with both groups 15-24 and 45-65 year old. For both perceived distances to bus stop and taxi station, the group of 15-24 year old had a significant difference with both 45-65 year and the 65 year and more groups.

The Pearson correlation was used to examine the relationship between the distance to destination and the residents' perception of their neighborhood. There was a negative significant relationship between perception of accessibility to facilities and perceived distance to grocery ($r=-0.157$, $p<0.016$), bakery ($r=-0.115$, $p<0.080$), ($r=-0.244$, $p<0.000$) and taxi station ($r=-0.176$, $p<0.007$). Also there was a fair negative correlation between perceptions of distance to facilities and the aesthetics of built environment. In addition, the correlation coefficient between environment aesthetics and perceived distance were significant for bus stop ($r=-0.151$, $p<0.021$) and taxi stop ($r=-0.148$, $p<0.024$).

The examination of the correlation between the crime immunity and perceived distances, showed that there was a negative significant correlation between crime immunity with grocery ($r=-0.147$, $p<0.025$), bakery ($r=-0.159$, $p<0.0116$), butchery ($r=-0.184$, $p<0.005$) and post office ($r=-0.191$, $p<0.004$). There

were two exemptions regarding the correlation between safety from crime and distance to facilities. There was no significant correlation between perceived distance to park and bus stop with safety from crime, participants closer to this facilities mentioned less safety from crime. This might be happened because this facility could be dominated by strangers. The Pearson correlation test showed that there was a negative significant correlation between satisfaction with the neighborhood and perceived distance to butchery ($r=-0.109$, $p<0.097$), post office ($r=-0.206$, $p<0.002$), library ($r=-0.113$, $p<0.085$) and park ($r=-0.123$, $p<0.061$). On the other hand, there was no significant correlation between satisfaction with neighborhood and perceived distance to Swimming pool, gym and soccer field. In other words, the more satisfied one was with his or her neighborhood, the more underestimated the perceived distance was. Such result may have resulted from the fact that such facilities are associated with lack of privacy for household. No significant difference was found among age groups and variables relating to built environment perception - such as aesthetic, accessibility to land uses, safety from crime, rate neighborhood satisfaction and walking.

With respect to the relationship between perceived distances and amount of walking, the Pearson correlation analysis found a positive significant connection between walking and perceived distances to grocery ($r=0.222$, $p<0.001$), butchery ($r=0.122$, $p<0.063$), post office ($r=0.118$, $p<0.073$), primary school ($r=0.15$, $p<0.022$), secondary school ($r=0.132$, $p<0.044$), bus stop ($r=0.116$, $p<0.077$), taxi stop ($r=0.134$, $p<0.041$) and gym ($r=0.121$, $p<0.066$). In other words, higher level of walking resulted in more accurate estimation of distance to the destinations. In addition, those destinations located in further distances away from home were linked with higher level of walking.

The one way ANOVA test indicated that there was a significant difference among the groups in terms of perceived distance to bakery ($F=2.169$, $p<0.093$), swimming pool ($F=2.285$, $p<0.089$) and gym ($F=2.347$, $p<0.074$). The Tukey HSD analysis showed that better educated individuals had better estimation of distance to bakery. For swimming pool, no difference observed between those with a secondary education and those with a University degree. Respondents with secondary education were found to have different estimation of distance to gym than those with a University degree. The difference in the participants' estimation of the distance to gym could be resulted from the higher frequency of usage by younger adults. Interestingly, there was no significant difference among educational categories in terms of walking activity amount.

The one-way ANOVA showed that there was a significant different among different types of household considering perceived distance to the grocery ($F=3$, $p<0.031$), taxi station ($F=4.13$, $p<0.007$) and bus stop ($F=4.224$, $p<0.006$). For perceived distance to the grocery, the household type as parents lived with children showed a significant difference to both other groups (household as living with partner and

single parents lived with children). Also, for both variables of perceived distance to bus stop and taxi station, there was a significant difference between the two groups of parent (with or without children). In addition, there was no significant difference among household type groups in terms of variables related to both built environment perception and amount of walking.

TABLE 1 - THE AVERAGE OF TIME (MINUTE) SPENDING TO NEAREST DESTINATION (PERCEIVED DISTANCE) IN COMPARISON WITH REAL GIS-MEASURED NETWORK DISTANCE

Type of local destination	Self-reported Distance Estimated			GIS-measured network distance	
	Number of Answered Question	Mean	Std. Deviation	Mean	Std. Deviation
Grocery	228	4.72	4.08	197	114.96
Bakery	228	8.30	6.83	372	197.13
Butchery	193	16.89	14.30	567	278.83
Post office	216	23.90	17.91	1350	331.09
Library	210	16.32	19.23	985	405.14
kindergarten	176	11.77	12.01	449	214.71
Primary school	195	10.94	10.43	648	265.25
Secondary school	188	10.56	10.49	446	149.57
Bus stop	226	6.22	4.86	343	142.46
Taxi station	223	6.06	4.83	279	133.53
Park	227	8.60	6.47	574	176.40
Swimming pool	141	12.58	12.99	1461	588.94
Gym	117	10.47	13.12	1461	588.95
soccer field	63	5.28	16.02	871	521.62

4. DISCUSSIONS AND CONCLUSIONS

There was a significant correlation between actual distance and perceived distance to the nearest surveyed facilities at neighborhood level (except for the nearest kindergarten and primary school). The more frequently the facilities were used, the more accurate distance estimation was. In addition, the more the participant walked, the more accurately they could estimate the distance to the specified destination especially those further away from home. Furthermore, the analysis showed that older participant could estimate the distance to daily regular facilities more accurately than the younger participants. Conversely, the younger participants could estimate the distance to specific facilities such as soccer field more accurately than the older ones. In addition, there was a positive but not significant correlation between walking and those attributes related to the perception of built environment at neighborhood scale including accessibility to facilities, aesthetics, safety from crime and satisfaction with local area. This fact explains that higher level of neighborhood awareness contributed to a better understanding of distance to facilities. The more satisfied a person was, the more accurate his/her

estimation was. The effects of personal characteristics such as household structure and education level on the individuals' ability to accurately estimate distance to facilities could be related to how frequently they used such facilities. There was a significant correlation between amount of walking and perceived distance to the mentioned destinations. In other words, the more amount the participants walked, the more accurately they could estimate their destination.

Although many factors had influenced the residents' perceived distance to local destinations at neighborhood level, the important factors seems to be how frequently they used those facilities. Finally, providing more comfortable and more pleasant environments for residents may encourage them to use local facilities more and indirectly get them to walk more often.

It is suffice to say that it is crucial for urban planners to watch and be aware of how residents perceive their neighbourhood area in order to increase physical activity/walking level through decreasing the perceived distance to local destinations.

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