

# RELATIONSHIP BETWEEN MULTIDIMENSIONS OF THE PERCEIVED ACCESS AND USAGE OF URBAN PARKS

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## ABSTRACT

*Studies about urban parks indicated that access is one of the most significant factors for using urban parks. However, the concept of multidimensional structural access should be considered. Hence, the purpose of this research is to evaluate the relationship between perceived access to multidimensional construct and usage of urban parks. A questionnaire survey was conducted among 400 visitors who were selected by random sampling of four urban parks in Tehran. Perceived access was measured in five dimensions including physical, transport, knowledge, social and personal. In the current research, Smart PLS software version 3 was used to analyze the validity of the hypotheses and the relationships between the research variables using the path analysis technique. The results indicated that all of the perceived access dimensions have a positive significant effect on the usage of parks. Furthermore, the personal and knowledge dimension had the most and the least effect among dimensions, respectively. Based on the results, urban planners and designers should improve the utilization of these vital spaces with the proper design of urban parks, taking into account the strong effect of perceived access dimensions.*

**Keywords:** Accessibility, green space, perceived access, proximity, safety, transportation

## 1. INTRODUCTION

In the overcrowded world of today and with the current conditions of life in metropolises such as Tehran, and especially by increasing apartment life, using public spaces, especially parks is one of the factors which is affecting the adjusting conditions and reducing the pressures and biological problems for people. Public green spaces which are comprising part of a city landscape, provide good conditions for leisure time and offer a variety of benefits for reducing stress, facilitating mental recovery, aiding bodily health and battle sedentary life (Bedimo-Rung, 2005; Byrne & Wolch, 2009; Cohen et al., 2007). Many studies have confirmed the beneficial effects of relationship between nature and the health of individuals (de Vries et al., 2003; Mitchell & Popham, 2007). This research indicated that various types of urban green spaces, including parks, playgrounds and multi-purpose areas have therapeutic properties and beneficial health effects (Jansson, 2010; Maas, 2006; Stigsdotter et al., 2010), especially if they are located near the houses (Maas, 2006; van den Berg et al., 2010). Unfortunately, due to increased urbanization, along with planning policies, the modern houses of people are further separated from nature and green spaces (Chiesura, 2004). Parks, as a significant part of urban landscapes, can provide nature near the homes of people to promote physical activity and with the aim of improving the health and morale of the people and establishing social interactions in the cities (van den Berg et al., 2010). Restricting access to green space may increase the vulnerability towards stressful events and, as a result, increase its damaging effects on people's mental and physical health (Kaplan, 1989). Largely, people who are living in areas lacking green space may be more negatively affected by stressful issues (van den Berg et al., 2010). Therefore, the availability of green space in the living environment is a significant environmental factor that moderates the relationship between stressful events and people's health (Byrne & Wolch, 2009; Wang et al., 2015a). Access to the park is considered

as one of the most significant variables for explaining the usage of park and as a result it is a key index for measuring the quality of urban life (Gould, 1969). However, the concept of multidimensional construct access should be considered.

### 1.1 Background of study

Accessibility is a broad, flexible, and slippery concept (Zelinsky, 2009). There are various dimensions of access concept that affect its definition. In the Dictionary of Human Geography, access is defined as a facility by which we can move from one location to another (Lau & Chiu, 2003). According to Harnik (2006), an accessible public space should be accessible to all individuals, regardless of physical capacity and financial ability, and it should offer service to all age groups. Access to all public spaces can be measured and used as an index of their dispersion rate (Song, 2012). Considering the positive role of open space in urban planning, allocation and equalization of urban open spaces should be considered as a significant issue for planners and policy-makers (Byrne & Wolch, 2009). To this end, access to green spaces and urban parks has been highlighted as a vital issue in spatial justice research. In such studies, access is often a factor in identifying the distribution of parks in different regions.

Based on the past studies, several factors may affect people's perceived access to the park and using them. For instance, Bayern and Wolch (2009) in their study argued that the park's characteristics and user characteristics may affect population's perceived access to the park and usage of park. The presented model in this research seeks to explain the usage of the park by relying on the individual and social characteristics of individuals. In this model, using includes four elements, one of which is the personal perceptions of park spaces such as access (Pasaogullari & Doratli, 2004). Pasaogullari and Doratli (2004) in their study about measuring access and usage of public spaces in Famagusta concluded that access to public spaces is affected by location, vicinity, travel time, physical and functional characteristics of streets and transportation. They stated that there is a positive relationship between access to a public space and its utilization. Dispersion, vicinity and roads (the physical structure of streets and paths) and access tools (cars, etc.) were considered as key variables for assessing access to public spaces.

Physical and psychological access to public spaces is a basic investigable issue for all open space planning (McCormack et al., 2008). The organizational-social aspect of access is distinct from its geographical aspect. Pirie (1981) described the concept of access as a capability to reach services and as a physical dimension of the distance between source and destination. Previous

research showed the contradiction between the subjective measured access (perceived access) and objective measured access (geographic access) (Ball et al., 2008; Jones et al., 2009a; McCormack et al., 2008; Wang et al., 2015b). However, planning models usually rely on quantitative standards such as the percentage of green areas in the total city area, the number of parks in the region, per capita, and distance (Song, 2012). These numbers can explain only some of the dimensions of open spaces in a city (Jones et al., 2009b), and they are not considered as adequate models to measure access to green spaces and parks (Gillespie & Msw, 2008; Hass, 2009). The length and time which are needed to go along a path are common variables, which gauge access as a function of geometric source based on the location and central location theory (Ferreira, 2017; Pirie, 1981), but the concept of access has evolved beyond a physical-spatial dimension and includes other significant personal-social factors, which are including informational factors, gender ideologies, and economic and cultural factors (Bisht et al., 2010; Ferreira, 2017; Gillespie & Msw, 2008; Pirie, 1981; Wang et al., 2015a). In some studies, the term "social-organizational access" was used to describe non-physical factors that limit or enable the capability to take services (Bisht et al., 2010; Gillespie & Msw, 2008; Kwan et al., 2003; Pirie, 1981). The concept of access is now described as a multi-dimensional construct in relation to physical and non-physical factors (Wang et al., 2015a). For example, Wang, et al (2015b) tested a multivariate park access model by collecting initial data in the two suburbs of Brisbane, China and Australia with a different socio-economic status, but with comparable parks infrastructures. According to their results, the most significant factors which are affecting the understanding of access to urban parks are geographical and situational characteristics such as proximity to the park, enjoyable walking and the number of parks in the neighborhood. Social variables which were including cultural uses of groups, joint activities, safety and leisure activities were of lower importance (Lau & Chiu, 2003). Studies also show that people with different social and economic backgrounds may display different responses to perceived access to park. This reveals the need for research in the relationship between socioeconomic variables and access to the parks (Hair et al., 2013). Wang et al. (2015b) using a multi-dimensional model of access to urban parks, use a comparative research project between the groups with different income. Respondents prefer sustainable transport modes such as walking and cycling. The physical and local characteristics of parks (e.g., proximity and travel time) are the most significant factors which are affecting perceived access. Both physical and socio-personal factors chip in the park accessibility in urban areas and support the complex multi-dimensional structure hypothesis of access concept.

Based on above mentioned, studies were conducted on access to parks and their perception, but the role of its various dimensions on using parks by

people is still unknown. Given the importance of parks and their undeniable role in people's lives, and given the importance of accessing urban parks by users and planners, it is as one of the most significant variables to explain using parks. This paper attempts to investigate multi-dimension role of the perceived access to urban parks on their usage in Tehran metropolis.

### 1.2 Research model and hypotheses

The main purpose of this research is to investigate the role of different dimensions of perceived access to urban parks on the use of them. In order to achieve this, a multidimensional model of perceived access to parks which has been developed by Wang et al. (2015b) was used. Based on the model (Figure 1) and purpose of the research, its hypotheses are raised as follows:

- H1: There is a significant relationship between the transportation dimensions of perceived access to urban parks and using them;
- H2: There is a significant relationship between the physical dimensions of the perceived access to urban parks and using them;
- H3: There is a significant relationship between the knowledge dimensions of perceived access to urban parks and using them;
- H4: There is a significant relationship between the social dimensions of perceived access to urban parks and using them;
- H5: There is a significant relationship between personal dimensions of perceived access to urban parks and using them.

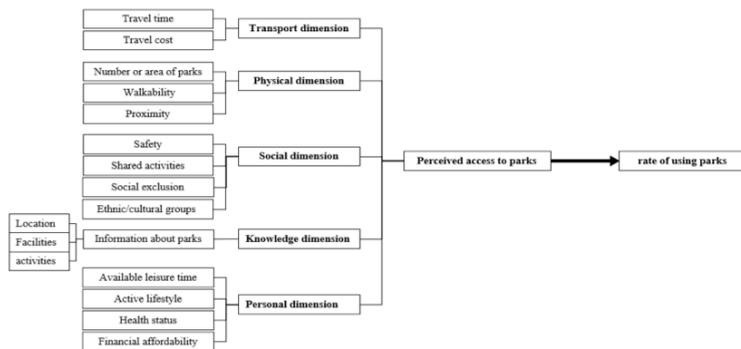


Figure 1: Research Model

## 2. METHOD

### 2.1 Study area

Region 1 of Tehran has ten districts and 26 urban vicinities. The area of the region, including its territory, is about 210 km<sup>2</sup>, and its population is about 445000 people. A mountainous region with gardens, rivers, valleys and ravines is the center of the Shemiranat. This area is one of the most desirable areas of Tehran due to its natural resources and cultural and historical heritage. The development of green space has been one of the distinguishing features of this area. Based on studies by the Ministry of Roads and Urban Development, the conventional and acceptable per capita of urban green space is between 7 to 12 square meters per person in urban areas of Iran, which is lower than the United Nations Environment Index (20 to 25 square meters per person). The green space per capita in the District 6 is about 53.23 square meters per person. The green space is 105 hectares in the District 6, which has the highest green space per capita in Tehran, and it is almost twice the global standard. This region has many parks with full park equipment including benches, lamp stands, trash bins, fitness equipment etc. The dominant vegetation in the region is the cypress, which is suitable due to the low temperature and lack of water resources and low water requirement of this type of plant.

In order to measure the research hypotheses, region 1 of Tehran was selected among the twenty-two regions and for collecting the initial data four urban parks were purposively selected as a sample in this area. High per capita green space and high utilization rate were the criteria of choice. Also the area had to be considered residential.

Urban parks can be built on small area lands and, despite the relatively area, they have a variety of advantages of being in nature, and provide residents with more convenient access through location among residential blocks. Four parks were selected among the parks in this area. Therefore, the selection of parks was based on size and their facilities. Also, the studied parks are free for all classes of society and age groups. Pictures of urban parks show in Figure 2.



Figure 2: Pictures of urban parks

## 2.2 Questionnaire design

A questionnaire survey probed the perceived access and usage of urban parks. The first part was questions about the respondents' personal data, such as age, gender, educational level and profession. Second part included perceived access which was developed by Wang et al. (2015b) and it is consisting of five dimensions: physical, transport, knowledge, social and personal dimension on a five point Likert scale (1= strongly disagree to 5= strongly agree). Third part evaluated usage of urban parks (daily, several times per week, weekly, monthly, seldom or never). All questionnaire survey procedures were performed in compliance with relevant laws and institutional guidelines, and the appropriate institutional committee has approved them. 392 questionnaires were systematic randomly distributed among adult visitors, regardless of social status and ethnic-racial backgrounds and collected during the week and at different times in four parks in the region 1, Tehran. 384 questionnaires were analyzed by excluding the incomplete questionnaires.

## 2.3 Data analysis

In the current research, Smart PLS software version 3 was used to analyze the validity of the hypotheses and the relationships between the research variables using the path analysis technique. In order to analyze the research data, in the first stage, the convergent and divergent validity and Pearson correlation

coefficient were examined between the variables of the research. In the next step, the construct validity of the questionnaire was investigated using the confirmatory factor analysis and, finally, the partial least squares method was used to test the research hypotheses.

## 3. RESULTS

### 3.1 Assessment of measurement model

Table 1 shows the results for the measurement model. Outer loadings, Composite Reliability (CR), Average Variance Extracted (AVE=convergent validity) and discriminant validity were assessed to reflectively indicators (Wang et al., 2015b). As represented in Table 1, all the factor loadings of the reflective constructs are well above the minimum threshold value of 0.60. Moreover, convergent validity was justified with all Cronbach alphas which were being above 0.7 and all Composite Reliability (CR) indices above 0.7, whereas the Average Variance Extracted (AVE) was above 0.5 for each variable, which is exceeding the recommended parameter values.

Table 1: Construct Validity

Construct	Item	Outer loading	Cronbach's alpha	CR	AVE
<b>Transport dimension</b>	Travel time	0.891	0.823	0.799	0.598
	Travel cost	0.916			
<b>Physical dimension</b>	Walkability1	0.817	0.841	0.821	0.625
	Walkability 2	0.819			
	Number or area of parks1	0.869			
	Number or area of parks2	0.819			
Proximity	0.822				
<b>Knowledge dimension</b>	Facilities	0.747	0.837	0.802	0.617
	Location	0.896			
	Information about parks	0.640			
	Activities1	0.761			
	Activities2	0.846			
Activities3	0.644				
<b>Social dimension</b>	Ethnic/cultural groups	0.768	0.790	0.786	0.590
	Safety1	0.894			
	Safety2	0.866			
	Safety3	0.639			
	Safety4	0.650			
	Safety5	0.753			
	Safety6	0.798			
	Shared activities	0.771			
	Social exclusion1	0.846			
	Social exclusion2	0.828			
	Social exclusion3	0.848			
Social exclusion4	0.893				
Social exclusion5	0.786				
<b>Personal dimension</b>	Available leisure time1	0.834	0.818	0.809	0.609
	Available leisure time2	0.799			
	Active lifestyle1	0.906			
	Active lifestyle2	0.872			
	Financial affordability	0.721			
	Health status	0.919			

Regarding the divergent validity, the difference between the indices of a structure is compared with that of other structures in the model. This is calculated by comparing the root of AVE of each structure with the values of the correlation coefficients among the structures. Table 2 indicates the correlation coefficients and divergent validity. The main diagonal of this matrix shows the square root of the Average Variance Extracted (AVE). In order to confirm the divergent validity, the square root of the average variance extracted must be higher than all the correlation coefficients of the corresponding variable with the remaining variables. For instance, the square root of the average variance which has been extracted for the social dimension variable is by 814%, which is higher than the correlation value of this variable with other variables. As indicated in the Table 2, the square root of the average variance which has been extracted for all variables is higher than the correlation of that variable with other variables. Below the main diagonal, the Pearson correlation coefficients are shown. The positive coefficient indicates a positive and direct relationship and the negative coefficient indicates a negative and inverse relationship between the two variables. All coefficients are significant at the error level less than 0.05 (Table 2).

Table 2: Correlation Coefficients and Discriminant validity

Independent Variables	1	2	3	4	5
1 Social dimension	<b>0.814</b>				
2 Transport dimension	0.654	<b>0.706</b>			
3 Knowledge dimension	0.439	0.517	<b>0.689</b>		
4 Personal dimension	0.741	0.437	0.339	<b>0.801</b>	
5 Physical dimension	0.420	0.397	0.516	0.380	<b>0.732</b>

### 3.2 Assessment of structural model

Multicollinearity should be tested before evaluating the structural model for results validation. Regression analysis was run for checking multicollinearity by SPSS (version 22). Some authors indicated that a regression model would have serious multicollinearity problems when the Variance Inflation Factor (VIF) is larger than 10, or tolerance is below 0.1 (Ho, 2006). The results show that the tolerance level is well below the VIF value of 5.00. PLS algorithm procedure indicated the R<sup>2</sup> values of the endogenous latent construct. This coefficient examines the ability to predict the dependent variable by independent variables. R<sup>2</sup> value is equal to 0.814. Based on this, transportation, physical, knowledge, social and personal dimensions

of urban parks together were able to predict by 81% of the changes in the usage of urban parks (Table 3). Q<sup>2</sup> criterion specifies the predictive power of the model, and if the Q<sup>2</sup> value takes three values of 0.02, 0.15 and 0.35, regarding an endogenous structure, it reflects the weak, moderate and strong predictability of structures or exogenous structures which are related to it. Q<sup>2</sup> value is equal to 0.424. The results show the proper predictive power of the model for the endogenous structures of the research and confirm the proper fit of the structural model (Table 3).

Table 3: Results of R<sup>2</sup> and Q<sup>2</sup>

Endogenous latent constructs	R <sup>2</sup>	Q <sup>2</sup>
use of urban parks	0.814	0.424

### 3.3 Q<sup>2</sup> criterion

The PLS results for the structural model are presented in Table 4. All hypothesized relationships were confirmed through the existence of statistically significant path coefficients (p < 0.05).

Table 4: Result of hypothesis testing and structural model

Hypothesis	Path	Path coefficients (β)	T-values	Decision
H1	Transport → use of urban parks	0.508	**5.016	supported
H2	Physical → use of urban parks	0.320	**4.744	supported
H3	Knowledge → use of urban parks	0.251	**3.359	supported
H4	Social → use of urban parks	0.345	**4.582	supported
H5	Personal → use of urban parks	0.434	**5.400	supported

The results of Table 4 showed that all of hypotheses were supported. Transport dimension was found as the most influence predictor of usage of urban parks among five variables (β=0.508, t=5.016, p<0.01). In this respect, H1 was supported by strong effects from transport dimension on usage of urban parks (β=0.508, t=5.016, p<0.01). H2 and H3 also were confirmed. Personal dimension was more influential variables (β=0.434, t=5.400, p<0.01) while social and physical dimensions had less explanatory power (β=0.345,

$t=4.582, p<0.01; \beta=0.320, t=4.744, p<0.01$ ). The result of analysis which has been supported H4 and knowledge dimension was found least influence on usage of urban parks among variables.

#### 4. DISCUSSION

Relying on the multidimensional construct of access to known parks in previous studies, the present research has analyzed the effect of various dimensions of perceived access on using urban parks. Based on the previous studies, both physical and social-personal dimensions significantly affect the multi-dimensional structure of access to parks (Lau & Chiu, 2003). The present research supports the effect of five dimensions of the hypothesis (physical, transportation, social, personal, and knowledge). The results of the current research reflect the strong effect of all aspects of perceived access on using parks.

Transportation dimensions include time and cost variables. The relationship between public services and residents is usually measured by distance or by travel time and travel costs (Yin & Xu, 2009). In many studies, GIS was used to model travel distance and time to reach parks (Erkip, 1997). In the present study, transportation dimensions are measured by asking two questions regarding the time and cost of reaching the park. Our findings indicate that transportation dimensions have the strongest effect on using parks. In past studies, proximity to parks was recognized as a significant and influential factor in perceived access to them. According to the Erkip (1997), access to public spaces depends on the travel time and its proximity (Talen & Anselin, 1998). The distance between the residence and the park is a significant measure of access to the park (Nicholls, 2001). The distance is one the most significant factors in explaining the frequency of using parks, especially for small and local parks (Byrne & Wolch, 2009; Giles-Corti et al., 2005; Nicholls, 2001). Parks that are easily accessible by walking are more widely used by residents, compared to large parks which are accessible only by cars (Pasaogullari & Doratli, 2004). With regard to the emphasis of studies on physical dimensions of access, our research results indicated a relatively strong effect on the usage of urban parks, and all of its three variables have significantly affected the general structures which are including the number of parks in the neighborhood, proximity, and the ability to walk. Given that the distance between residents and public spaces is associated with the theory of maximizing access to public spaces and minimizing walking distance, public spaces should be distributed in an integrated manner in a residential area (Talen, 2000).

The public space is successful when one can easily cross it; see it from a distance and close. The presence of sidewalks is as a way to encourage the connection between private and public spaces (Pasaogullari & Doratli, 2004). The pedestrians want sidewalks, which along with creating diversity, constitute the humanistic scale and details (Lau & Chiu, 2003). Apart from this, the availability of public transportation or having private cars also assists in increasing access to public spaces (Harnik, 2006). Moreover, a public space is available for everyone, regardless to the place of residence, physical capabilities, or financial resources (McCormack et al., 2010a).

The personal dimension of perceived access includes four significant variables such as: leisure time, active lifestyle, health and financial ability; among which, the general attitude of individuals towards their health and active lifestyles have had a significant effect on using parks i.e. the preference for being in open space and exercising outdoor rather than being in home. Income and financial ability are among the raised issues in some of the studies which are relating to the perceived access to parks (Lau & Chiu, 2003; Wang et al., 2015b). In the current study, the question posed regarding the financial ability of individuals are about the cost-effectiveness of using local parks and performable activities in them in relation to other activities in public places and that people's income is not taken into account.

Security is recognized as one of the most significant variables in the social dimension of perceived access. According to the results of Wang et al. (2015b) among the social-personal variables in the access model the safety variable has had the highest effect on access to parks. (Pasaogullari & Doratli, 2004). Pazhouhanfar et al., (2015) in measuring the ease of usage of public spaces has raised safety as a factor which is affecting people's use of urban parks, and that even lack of it can cause failure in using space. According to its importance, in the present research, several questions were asked to measure the effect of this variable. The obtained results are in line with other studies which have been supported the importance of this variable with great effect. The presence of security in the park, law enforcement personnel and security guards can affect the perceived safety (Little, 2011). Dangers are everywhere in our everyday life, including in pocket parks (Maas et al., 2006). City park departments can consider management measures that improve the park's environmental security via environmental design, such as increasing street vision, improving facilities (for example, lighting), and increasing the frequency of safety patrols (Wang et al., 2015b). Joint activities, ethnic and cultural groups and other social deprivations are the studied variables in social dimensions (McCormack et al., 2010b). Various services and the rate

of facilities of the parks have an effect on the residents (Wang et al., 2015b). However, the results indicate that the dimensions of knowledge i.e. users' information about parks, including facilities, location and implementable activities in them than other dimensions, have less relationship with their usage of parks.

This study analyzes and evaluates the effect of dimensions of perceived access, including personal, social, knowledge, transportation, as well as physical dimensions, each of them is containing factors about the usage of urban parks. However, the study has some limitations.

This study analyzed and assessed the impact of access perception dimensions including personal, social, knowledge, transportation, as well as physical dimensions, including factors, on park use. This study has a number of limitations. Firstly, data are collected in urban parks (up to 3,000 square meters) and do not include larger parks. This means that there is a likelihood of differences in the results of this study in large urban parks. On the other hand, this study is limited to one geographical area, the city of Tehran, so the results may only be generalized to geographical features similar to that area. Secondly, there may be other features of green space other than the factors considered in this study that may affect people's accessibility perceptions. In some similar studies income has been studied and compared as one of the key factors affecting access perception studies. In the present study, the income factor is not considered and no comparisons are made in this regard. Thirdly, although there was information about the parks, details of such characteristics as social and economic details of the individuals have been not presented. Ethnic and ethnic backgrounds are also factors to be considered in future studies. These factors may also limit the generalizability of the study, which should be addressed in future studies.

## 5. CONCLUSION

Parks can provide a variety of natural environment benefits to residents, especially if they are easily accessed and near the homes of people. Therefore, the availability of green spaces, including parks, is a significant factor for people, especially metropolis populations such as Tehran. In particular, urban parks can be built on small areas, which can be seen all over the city, and despite the relatively small area, provide the physical and mental health which has been improvement by planning and designing the right types of benefits of location in nature. Besides the area and number of parks, other several factors affect using parks. Based on the results of this research, personal dimensions including leisure time variables, active lifestyle, health and financial ability have the greatest effect on the usage of urban parks. In general, in order to

meet the various demands of people of parks, planners and urban designers can summarize what is said about the concept of perceived access; its dimensions and effect about the usage of urban parks, with the proper design of urban parks will improve using these vital spaces. Despite finding various suggestions based on this study, briefly mention some points for the managers and policy makers. Provide timely and accurate information to build trust in citizens to draw attention to the green space. Creation of new parks to optimize access for citizens, especially areas of the city that have problems with radius of access to the parks. Pay attention to local cultural features in the design of urban parks. Enhance public transport to access parks. Strengthen the sense of security for citizens in various ways. Pay attention to the needs and requirements of all age groups.

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