A Study on Relationship between Public Services Accessibility and Utilization in the Case of Public Parks of Austin, Texas

공공시설의 접근성과 이용도의 상관성에 관한 연구, 텍사스주 오스틴의 공립공원의 경우

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※ Keywords : Public Parks, Public Facilities, Accessibility, Park Utilization, GIS

Ⅰ. Introduction

According to the literature, there are many socio-economic and demographic factors and reasons for selecting or not using certain facilities among publicly provided services. The objective of the current study is to focus on the relationship between accessibility to public parks and utilization. It is evident that in the utilization of public services, not only service level (or service quality), but the accessibility is equally important and must be taken into consideration. However, the current study assumed that facility-dependent factors such as Operation strategies (Scott & Jackson. 1996), Promotion and marketing (Scott & Jackson. 1996), Utilization Cost (Scott & Jackson. 1996), and Service Quality or Service Level (Ottensmann. 1994) are similar all across the public parks in Austin, and that those factors do not significantly affect the relationship between services accessibility and utilization.

In fact, the existing literature among the utilization studies of parks and recreation facilities does not indicate previous research that investigates the direct relationship between services accessibility and utilization. Meanwhile, among the studies of such services as library and health services that public services evaluation is easily available, there have been many studies regarding the relation between services accessibility and utilization (Zweizig & Dervin. 1977 ; Ottensmann. 1994), but the factors and constraints that affect services utilization are different. So, in deeply investigating the relationship between the accessibility and utilization of park services, this study identified utilization factors that as 'intervening factors' affect the relationship between services accessibility and utilization.

Utilization of park facilities was modeled as multiple regression models where the independent variables were those found to affect users' utilization the most. Furthermore, based on the modeling results, the importance of utilization factors for the equity in services allocation was discussed.

II. Methods

1. Target Population

The target population for this study is the urban neighborhood residents of Travis County, Texas. The study area was the city of Austin, Texas. The reasons for choosing this area are as follows. First, there is a great deal of spatial data available. The city provides numerous GIS database warehouses on-line and on the web, enough to carry out the current research (ftp://issweb.ci.austin.tx.us/pub/coa_gis.html). Second, city-wide, neighborhood planning has been very active since the Austin City Council adopted the Dawson Neighborhood Plan on August 28, 1998. Also, the city's Planning, Environmental & Conservation Services Department has taken the initiative to work with neighborhood representatives to produce a neighborhood plan. Subsequently, a lot of city background information regarding public services in relationship to neighborhood planning is available (Austin City Connection. 2001).

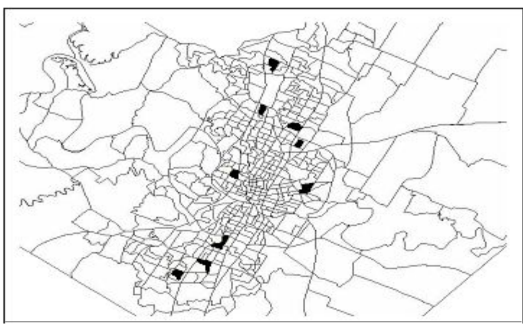
2. Study Area Sampling

As well as the cluster sampling, the current study utilized "stratified random sampling" which uses information known about the total population prior to sampling to make the sampling process more efficient. First, all elements of the total census tracts (N=181) of Travis County were distinguished according to their values on relevant characteristics. In doing so, Race (i.e., white, black, and hispanic), and Median Household Income (high, medium, and low income levels based on 2000 census data)(White. 1987 : p69) formed the sampling strata. Next, census tracts were sampled randomly from within these strata. And, finally, census block groups are randomly selected from those census tracts chosen.

<Table1> Details of Sampled Block Groups

Race	Income Level	Census Tract	Block Group	Population	Race (%)	Median Household Income ($/year)
White	High	18.28	1	1,830	82.50	75,436.00
		16.03	5	1,318	95.68	79,179.00
	Medium	18.17	2	1,285	89.10	61,838.00
		24.24	2	2,716	61.93	41,250.00
	Low	17.47	3	1,672	66.57	50,391.00
Hispanic	Medium	20.03	4	1,957	53.29	38,636.00
	Low	18.12	3	1,750	76.06	29,909.00
		18.06	3	3,224	52.85	27,188.00
Black	Medium	21.09	2	1,570	59.60	31,553.00

<Figure1> Distribution of Sampled Block Groups



3. Operationalization of Accessibility Measure

It is true that different accessibility measures may produce different spatial patterns of accessibility and, depending on the concept of access, the distributional equity of public services may vary (Talen & Anselin. 1998 ; Talen. 1998). The choice among them depends on the relevant policy questions (Lindsey, et. al. 2001 : p334). So, the current study considered the characteristics of public parks under study, and the features that each of the five most widely used accessibility models: four distance-based models of Gravity Model, Minimum Distance Model, Travel Cost Minimization Model, Container Approach (Talen & Anselin. 1998); and Covering Objectives Model (Nicholls. 1999 ; Sui. 1999 ; Lindsey, et al. 2001). According to the following considerations, the Gravity Model was employed for the current study to measure accessibilities to public parks in Austin.

First, in the measurement of the public's accessibility to a given facility or service, the gravity model is the most useful because it derives a weighted number or value that considers all the potential residents of near or distant neighborhoods. Another useful element of the gravity mode is that it incorporates interaction to be measured in a cumulative fashion, irrespective of the unit of analysis or boundaries. In reality, neighborhood residents routinely travel across arbitrary geopolitical units such as counties, census tracts, or zip code areas to access public parks.

Second, this measure, called also the spatial interaction model, is one of the simplest, yet most widely used models(Pacione. 1989). It identifies levels of human interactions between different locations based on principles of Newtonian physics where facilities are weighted by their size and adjusted for the 'friction of distance'. In this specific use of the model, the force of attraction between resident's location and facility location is proportional to the attractiveness of the facility and inversely proportional to the distance between resident and facility. The basic form (Talen & Anselin. 1998) of this model is

$$Z_i^G = \sum \left[\frac{S_j}{d_{ij}^{\alpha}} \right],$$

where "S_j"reflects the number of facilities or their size, and for each facility location "j", "d_{ij}^{α}" is a distance decay factor, with distance "d_{ij}" between zone "i" and facility "j", and friction parameter "α"(Talen & Anselin. 1998). In this index equation, "α"is between 1 and 2, reflecting the rate of increase of the friction of distance (Geertman, et al. 1995). The current study set the "α" value to be 1.

4. Data Sources and Preparation

The City of Austin has comprehensive data sources that make it possible to conduct accessibility and public services utilization studies at a census-based level. The data sets utilized for the current study are from four major sources (see Table 2).

The primary data sets were mainly GIS TIGER lines and their pertinent attribute tables are from the official website of Austin (www.ci.austin.tx.us) and Travis Central Appraisal District (TCAD). The configuration of the census areas in the census geography is recorded on the U.S. Bureau of the Census's TIGER (Topologically Integrated Geographic Encoding and Referencing) file.

The second data source was the 2000 Census from the U.S. Bureau of the Census. The Census data were mostly from two sources: SF1 (Summary File 1) and SF3 (Summary File 3). Most of socio-demographic data for stratifying census tracts and other census units were from the SF1 of Census 2000. These were then disaggregated to the level of census block, the smallest census unit available. The remaining economic data, such as median household income, were from the SF3 of Census 2000.

The third source was the official website of the city of Austin (i.e., Austin City Connection. 2001). The website provided administrative boundaries, the locations of the public parks, street center lines, address points, and administrative services area boundaries.

The fourth data source was the mail-out survey conducted during August and November of 2003. The survey questionnaire was composed of an introduction letter, questions about public parks utilization, and the respondents' background information as well as an actual map of the recipient's living area and the Austin public parks inventory for reference.

<Table2> Data Types and Sources

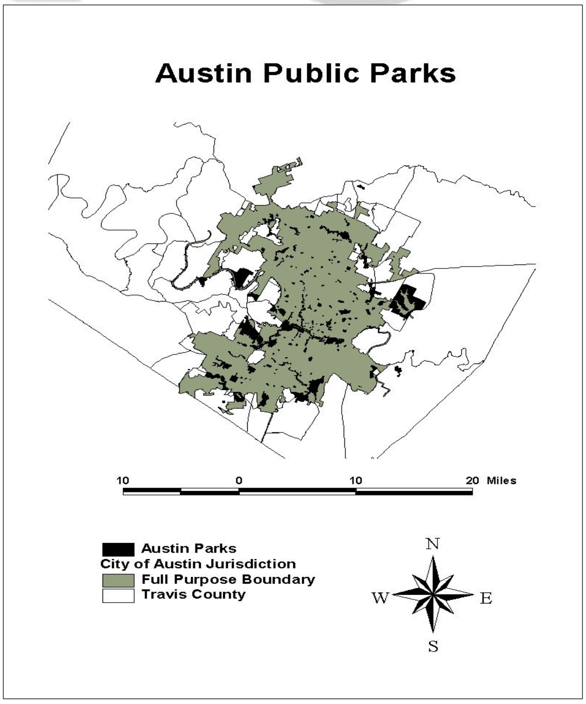
Sources	Data	Type	Format
Travis Central Appraisal District (TCAD)	Parcel GIS Attribute Table (owner's name & address)	Table	.dbf file
Austin GIS data set	City Boundary (full)	Polygon	Arcview shp
	Public Parks (city)	“	“
	Address Points	Point	“
	Street Center-lines	Line	“
	Austin Parcel Data	Polygon	“
2000 Census Tiger data	County Boundary	Polygon	“
	Census Tract Boundary	“	“
	Block Groups Boundary	“	
2000 Census SF1	Socio-demographic data	Table	.dbf file
2000 Census SF3	Economic data	“	“
Mail-Out Survey	Parks Utilization Data	“	“
	Socio-demographic Info.	“	“

5. Accessibility Measuring Method

The spatial distance may be calculated in various ways such as 'straight-line distance (i.e.,"as the crow flies")', 'network distance', 'travel-time distance', and so on. The current study used 'network distance', which is measured by finding the shortest path applied to the actual street network lines. For this task, Network Analyst, an extension utility for Arcview software, was utilized. Also, the Avenue script was used for measuring the basic network distance between each park centroid location. The center of each neighborhood unit was obtained from ESRI online support center (http:// arcscripts. esri.com/details.asp?dbid=11572). By simulating the situation closer to the actual travel time of neighborhood residents between supply location and demand location rather than using straight-line distance measure, the accessibility measurement based on network distance is generally accepted as a better approach in accessibility studies (Geertman & Risema Van Eck. 1995 ; Talen & Anselin. 1998).

Meanwhile, the process of measuring the network distance between each neighborhood and public park is not possible without having the centeroid points of each neighborhood and public park. For this important process, the SpaceStat extension for Arcview was used (Anselin. 1999), and the detailed procedure conformed to the instructions in "Spatial Data Analysis with SpaceStat and ArcView Workbook (3rd Edition)".

<Figure2> Distribution of Public Parks in Austin



6. Austin Public Parks Inventory

As of 2002, according to Austin City Connection 2001, the Austin Parks and Recreation Department(PARD) oversees more than 23,800 acres of land containing 191 parks, 8,847 acres of preserves, and 3,394 acres of creeks and canyons under its jurisdiction. These consist of 84 neighborhood parks; 12 district parks (i.e., Balcones, Bartholomew, Northwest, Bull Creek, Dick Nichols, Dove Springs, Garrison, Givens, Mable Davis, Northeast, and Pease); 19 metropolitan parks (i.e., Circle C, Commons Ford, Emma Long, Walter E. Long, Mary Moore Searight, Roy G. Guerrero, 10 Town Lakes, Walnut Creek, and Zilker), 34 greenbelts, 29 special parks, and 14 preserves, as defined by Austin PARD.

Table 3 shows a breakdown of this figure by the different kinds of park and open space. The entire list of Austin Parks Inventory was attached to the survey instrument.

<Table 3> Public Parks Inventory of Austin PARD

Type of Parks	No. of Facilities	Acreage
Neighborhood Park	84	1,037.45
District Park	12	706.36
Metropolitan Park	19	12,548.71
Greenbelts	34	6875.99
Special Park	29	345.06
Preserves	14	9,114
Total	191	27,748.00

Note: Figures based on Austin Parks Directory, Austin City Connection, 2001

7. Public Parks Utilization (Mail-Out Survey)

In the literature on public services utilization, socio-economic and demographic factors that affect the utilization of public parks facilities are summarized in Table below.

<Table 4> Factors Affecting Parks Facilities Utilization

	Factors	Blake (1984)	Mutter (1985)	Scott & Jackson (1996)	Erkip (1997)	Barnes (2001)
Social Factors	Gender	0				0
	Race	0				0
	Age	0				0
	Life-cycle	0		0		
	Income				0	
	Home ownership					0
	Length of Residence		0			0
	Marital Status					0
	Car ownership				0	

	Level of education				O
	Employment status				O
	Availability of time		O		
Utilization Patterns	Companionship pattern	O			
	Perception of other users			O	
	Fear of crime		O		
	Distance			O	
	Information of Parks		O		

The members of study population were asked to name the public parks they usually visit in the city of Austin and the names of those parks were to be stated "in the order of the frequency of visit, based on the contents of Austin Parks Inventory given within the survey booklet. Also, the final section of the survey instrument consisted of socio-economic and demographic questions, such as level of education(barnes. 2001), ethnicity(Blake. 1984), age(Blake. 1984), gender(Blake. 1984), length of residence(Mutter. 1985; barnes. 2001), home-owner status(barnes. 2001), household income(Erkip. 1997), and employment status(barnes. 2001). There were nine variables initially selected regarding public parks utilization pattern: (1) frequency of visit; (2) travel method; (3) travel time; (4) maximum travel time; (5) availability of leisure time(Scott and Jackson. 1996); (6) fear of crime(Scott and Jackson. 1996); (7) information about parks(Scott and Jackson. 1996); (8) perception of other users(Scott and Jackson. 1996); (9) overall satisfaction of park use.

III. Data Analysis and Results

1. Direct Relationship between Parks Accessibility and Utilization

1) Individual Dimension

First, this section tested if accessibility to public services directly affects public services utilization, which means that households are more likely to utilize the closer parks more frequently. The relationship between network distance(i.e., accessibility) and utilization was analyzed among the parks that were named by survey respondents, and the network distances of those named parks were calculated by the classifications of naming tiers (Table 5).

<Table 5> Differences of Distance by Utilization

	Naming Tiers (in order of the frequency of visit)				
	1st	2nd	3rd	4th	5th
Park Number	176	155	126	85	52

Distance (total)	772.50	736.01	680.98	444.02	316.43
Distance (minimum)	0.08	0.17	0.28	0.09	0.42
Distance (maximum)	21.3	19.16	21.29	17.19	19.43
Distance (mean)	4.38	4.74	5.40	5.22	6.08
Std. Deviation	4.34	3.96	4.08	4.38	4.32

Table 5 above displays the differences in distance by frequency of visit, that is, individual frequency of visit to chosen parks. As the table indicates, park visitors more frequently visited the closer parks among the public parks they personally chose. If one of the chosen parks is farther away from the households than the others, they tend to use the park less frequently. This relationship between network distance and utilization only belongs to descriptive statistics and is not enough to lead to any statistically significant conclusion, and it may include some bias as different individuals' behavior of park choices may be more complicated. But, it seems that once a household chooses a set of public parks, on the average, the residents tend to visit closer parks more frequently.

2) General Dimension

Among the overall public parks, the relationship between accessibility (i.e., network distance) and utilization was investigated by checking whether a household chose the park closest to the residence. For this analysis, Arcview 3.2 was used to gather the information about the closest parks from each residence. The closest park names, acquired by the help of Arcview 3.2 Network Analyst, were compared with the named parks that each survey respondent listed on the survey questionnaire. As the average distance of public parks was expected to be different by park type(see Table 3), the relationship between network distance and utilization was analyzed within each park type. The variables were transformed into nominal scale (i.e., "yes"if named park of a particular park type is identical to network-based closest park of the same park type; and "no"if not). A Chi-Square test was employed to analyze the relationship between network distance and utilization.

As Table 6 below shows, there is no significant relationship between network distance and park utilization. The chi-square values associated with one degree of freedom at the 0.005 level is 3.84, while the actual values from the analysis were between .026 and .522. None of the p-values were small enough (i.e. < 0.005) to reach a conclusion of any significant relationship, which applies to all park types. Therefore, for overall parks, it is concluded that there is no significant relationship between accessibility(i.e., network distance) and utilization, which means that even though a park may be the closest to a household, it is not always true that a household will choose to use the closest park. In addition, though showing insignificant p-values, the Phi values for the total park types indicate an extremely low level of correlations (0.012 ~ 0.052) between network distance and utilization; a Phi value of 0 indicates no correlation, with a range of 0 to 1.

<Table 6> Chi-Square Test of Network Distance and Utilization

Park Types	N	Visit to Closest Parks?		Chi-Square Test			Correlations	
		% Yes (n)	% No (n)	Value	df	Sig.	Phi	Sig.
Metropolitan Parks	196	19.4 (38)	80.1 (157)	0.242	1	0.623	0.035	0.623
Greenbelts	196	3.1 (6)	96.4 (189)	0.032	1	0.859	0.013	0.859
Preserves	196	2.6 (5)	96.9 (190)	0.026	1	0.871	0.012	0.871
District Parks	196	34.2 (67)	65.3 (128)	0.522	1	0.47	0.052	0.47
Special Parks	196	0 (0)	99.5 (195)	n/a	n/a	n/a	n/a	n/a
Neighborhood Parks	196	26.5 (52)	73.0 (143)	0.363	1	0.547	0.043	0.547
Total (mean)	196	-14.30	-85.20					

3) Summary

As described, the analysis of the relationship between network distance and utilization precluded any simple generalization because the individual dimension of relationship between network distance and utilization was totally different from its general dimension of relationship between distance and utilization. Individually, he or she prefers closer parks by showing a higher frequency of visit to those parks once he or she had selected a group of public parks that he or she usually use. But from the general viewpoint of overall parks, the direct relationship between parks accessibility and utilization denied any simple generalization.

So, in investigating the relationship between the accessibility and utilization of park services, this study identified utilization factors that as 'intervening factors(i.e., utilization factors in Table 4)' affect the relationship between services accessibility and utilization. Then, utilization of park facilities was modeled as multiple regression models where the independent variables were those found to affect users' utilization the most. Therefore, the overall park facilities utilization behaviors were predicted.

2. Multiple Regression Analyses of the Relationships between Accessibility and Utilization

1) Overview

As shown in previous section, the direct relationship between parks accessibility and utilization denied any simple description. This section investigates more deeply whether it is possible to explain the relationship between parks accessibility and utilization by looking into what kind of park utilization factors(Table 5) affect the accessibility to the parks the survey respondents answered as their usually visited parks. So, the dependent variable was accessibility to the parks that respondents used and the independent variables were utilization factors.

2) Bivariate Analyses between Accessibility and Utilization factors

Bivariate analyses between utilization factor variables(i.e., independent variables) and network distance(i.e., dependent variable) revealed that not all but part of independent variables affected not only network distances to overall parks, but also those to individual park types (see Table 7 below). Based on Table 7, each set of independent variables was included into a multiple regression analysis according to the classification of park types.

<Table 7> Correlations between Utilization Factors & Network Distance by Park Types

	Overall Parks	Metropolitan Parks	Greenbelts	District Parks	Neighborhood Parks
Age					
Gender					
Race	●	●	●		
Income					
Length of residence	○	○	○		
Child home	○				
Education level					
Marital status					
Employment status					
Frequency of park visit					
Transit method	●	●			
Travel time	●	●		●	●
Maximum travel time	●				
Availability of leisure time			○		
Fear of crime					
Information of parks	○				○
Perception of others				●	
Overall satisfaction					

Note: ● - significantly related; ○ - inversely significantly related

3) Correlations among Utilization Factors

Correlations among independent variables were investigated and it was found that there were no significant correlations (i.e. correlation coefficients over 0.9) high enough to cause doubt about any 'multicollinearity' when they may be included into a multiple regression analyse. That is, Table 8 below displays the Pearson correlation coefficients among utilization factors found to be significantly related to network distances to public parks. As described later in multiple regression analyses, due to the size of responded population in the survey (total number = 206), variables having correlation coefficients of over ±0.1 between them showed the relationship of multicollinearity. According to Table 8, some independent variables were included in or excluded from regression analyses based on their relative strength of influence on the dependent variable (i.e. network distance).

<Table 8> Correlations among Selected Utilization Factors

	Race	Child home	Length of residence	Transit method	Travel time	Maximum travel time	Availability of leisure time	Information of parks	Perception of others
Race									
Child home	-0.086								
Length of residence	-0.176	-0.136							
Transit method	0.038	-0.032	-0.018						
Travel time	0.058	-0.12	0.039	0.175					
Maximum travel time	0.103	-0.119	-0.03	0.157	0.471				
Availability of leisure time	-0.002	-0.189	0.095	-0.106	0.05	0.04			
Information of parks	0.093	0.045	0.11	0.018	-0.093	-0.014	0.192		
Perception of others	-0.064	0.057	-0.091	0.02	0.036	-0.031	0.208	0.041	

4) Multiple Regression Analyses for Network Distance to Parks

The findings of the multiple regression analysis of network-based travel distance to overall parks are presented in Table 9. This model accounted for approximately 18.4 percent of the variance in network distances to overall parks (p=0.000, R2=0.184). Although the R^2 value seems relatively small, it was described in the research framework with major predictors for park utilization as Promotion and Marketing (Scott & Jackson1996), Utilization Cost (Scott & Jackson. 1996), Service Quality or Service Level (Ottensmann. 1994), and Facilities & Programs (Hong. 1988) were considered as a constant in the current study. That is, the independent variables for explaining parks utilization were only restricted to park users' characteristics.

The method of entering variables was backward regression method. Durbin Watson's residuals index was 1.869, indicating that there were no significant correlations among residuals, which means that the regression model is valid. If the index is near 0 (+ correlations) or 4 (-

correlations), the regression model becomes inappropriate because of the presence of significant correlations among residuals (Woo 2001, 338).

According to the result of an ANOVA test (F=8.823, Sig.=0.000), this multiple regression analysis has proved to be appropriate. As the table shows, four variables out of initial seven variables met the entry requirement to be included into the equation (length of residence, child home, transit method, and travel time) and three other variables didn't meet the entry requirement (allowed maximum travel time, information of parks, and race). The beta values indicate the relative influence of the entered variables on the dependent variable. Transit method (0.238) shows the greatest influence on network-based travel distance, followed by travel time (0.223), length of residence (-0.161), and child home (-0.155). The direction of influence for length of residence and child home were negative, while the rest were positive.

<Table 9> Result of Multiple Regression Analysis (backward) for Network Distances to Overall Parks

Dependent Variable	Independent Variables	Standardized Coefficients (Beta)	Significance (P-value)	R2	Durbin-Watson	ANOVA (P-value)
Network Distance	res_yr	-0.161	0.028	0.184	1.869	0.000
	rnk_cld	-0.155	0.037			
	rnk_how	0.238	0.001			
	rank_tak	0.223	0.003			
	max_tak	0.039	0.624			
	fc_info	-0.091	0.258			
	rnk_rce	0.122	0.126			

Note: res_yr = length of residence; rnk_cld = child home; rnk_how = transit method; rnk_tak = travel time; max_tak = allowed maximum travel time; FC_INFO=info of parks; rnk_rce = race

As such, multiple regression analyses of network distance to the rest of park types were performed, and Table 10 below displays the summary of the results by park type. The result that R2 values are relatively small, ranging between 0.066 and 0.322, can be explained by pointing out the assumption of the current study that parks facility-dependent factors are similar across the city, and that they were excluded from the study framework. And, the variables were not normally distributed, so Standardized Coefficients were employed to show the comparison among the effects of independent variables on dependent variables.

Table 10 : Summary of Multiple Regression Analyses for Network-based Network Distances to Public Parks by Park Type

	Standardized Coefficients - Beta (bold when p-value < 0.005 and entered into the regression)				
Independent Variables (Dependent Variable : Network-based Travel	Over-all parks	Metropolitan Parks	Greenbelts	District Parks	Neighborhood Parks

Distance to Parks)						
R2		.184	.089	.322	.066	.096
Social Factors	Age					
	Gender					
	Race	.111	.143	.422		
	Income level					
	Length of residence	-.161	-.221	-.280		
	Child home	-.155				
	Education level					
	Marital status					
	Employment status					
Utili-zation patterns	Frequency of visit					
	Transit method	.238	.194			
	Travel time	.223	.107		.169	.222
	Max. travel time	.040				
	Avail. of leisure time			-.373		
	Fear of crime					
	Info. of parks	-.083				-.187
	Perception of others				.204	
	Overall satisfaction					

5) Summary

This section of the chapter investigated whether the selected utilization factors affect the network-based travel distances to public parks. As previously described, it was found that several utilization factors were significantly related to network distances when residents choose and use their favorite public parks. The current study identified significant utilization factors that differentiated network distances to public parks. The results are discussed in the conclusion chapter, based on Table 10.

IV. Discussion and Conclusion

1. Discussion

In the utilization of public services, not only service level (or service quality) but accessibility is equally important and must be taken equally into account for the assessment of service utilization (Ottensmann. 1994 : p111). However, the current study assumed that facility-dependent factors are similar all across the parks in Austin, and that those factors do not significantly affect the relationship between services accessibility and utilization. As analyzed, the analysis of the relationship between accessibility and utilization precluded any simple generalization because the individual dimension of relationship between accessibility and utilization was totally different from its general dimension of the relationship between distance and utilization. Moreover, as the public parks in Austin are classified into six different types, it also seems to add to the complexity of the generalization. Therefore, the study recognized the need for some intervening factors that would connect the two variables - accessibility and utilization.

Through the literature, it was found that there have been studies that explain some aspects of the relationship between accessibility and utilization of public services such as libraries and health services, involving utilization factors(i.e., service user's social background and utilization patterns)(Ottensmann. 1994 ; Erkip. 1997). So, most of the utilization factors found in the literature thus far were gathered and included in the statistical analysis for explaining the relationship between public parks accessibility and utilization. According to the results, significant utilization factors were found and they differentiated travel distances to public parks(see Table 10).

2. Conclusion

Though there may be many concepts of being "equal," generally speaking, the ultimate goal of the public services allocation studies is the equal accessibility to services between the minority and the non-minority groups in the society. Given this, such social factors as race (Talen. 1997, 1998), age (Nicholls. 1999), gender (Ruddick. 1996), and social class such as income level (Erkip. 1997), housing property value (Talen. 1998)), and population density (Linsey, et. al. 2001) have been the most dominant socio-demographic factors which researchers and policy-makers use to determine fair allocation. It may be said that the traditional way of park services allocation that does not consider much of the urban residents' actual needs and tendencies to choose their favorite places(i.e., top-down approach). But, this study hypothesized that, according to the unique park utilization factors (i.e., parks users' social factors and utilization patterns), their travel distances to public parks of their own choosing would be significantly different. The current study found that part of these traditionally used social factors significantly affected the residents' travel distances to parks, plus other newly-found factors that the literature used to consider as "parks utilization patterns" in people's behavior of park use(see Table 10).

That is, among the social factors included, only race, length of residence, and child home were significant predictors of travel distances to public parks. Among utilization patterns, transit mode, allowable maximum travel time, availability of leisure time, information of parks, and perception of others were also significantly related to travel distance to public parks. Age, gender, income level, education, marital status, employment status, and such utilization-pattern variables as frequency of visit, fear of crime, and overall satisfaction were not significant predictors of network-based travel distance to overall parks, as well as to any individual type of public park.

Interestingly enough, all those utilization factors were not unanimously related to people's travel distances to all types of parks. But, according to park type, the significantly affecting variables were widely different. Regarding future parks allocation, the implications helpful for practitioners and urban planners are as follows:

First, among those predictor variables, race (Pearson correlation =.17), length of residence (-.15), child home (-.15), transit method (.27), travel time (.30), allowable maximum travel time (.21), and information of parks (-.15) were the predictors of travel distance to overall parks without any classification of park type.

Second, people's racial background only affected travel distance to metropolitan parks and greenbelts. According to descriptive statistics, Whites travel greater distances to metropolitan parks (Whites, 7.11 miles; non-Whites, 5.56 miles) and greenbelts (Whites, 6.51; non-Whites, 2.04), but it does not apply to travel distance to district parks and neighborhood parks.

Third, residents' length of residence also affected travel distance to metropolitan parks and greenbelts. As people live longer at the same residence, they are more likely to travel shorter distances to overall parks, metropolitan parks and greenbelts, but this does not apply to travel distance to district parks and neighborhood parks

Fourth, whether a resident has a child or children in the home does affect travel distance to overall parks without the classification of park types. When people have children home, their travel distance (=4.52miles) to overall parks was shorter than that (=5.41miles) when there are no children at home.

Fifth, park users' availability of leisure time affected travel distance only to greenbelts, but as they have more leisure time, they tend to choose greenbelts within a shorter travel distance.

Sixth, according to how much information the residents have, they chose neighborhood parks closer to their residence (rho=-.218, p=.020). It may indicate that people possessing more information about public parks in the community do not have to travel a long distance especially to neighborhood parks. The bivariate analysis between information of parks and park type also shows that information of parks is significantly related to only travel distance to neighborhood parks.

Lastly, according to how well the park users evaluate other park users, their travel distance is significantly different, particularly to district parks. If they evaluate other users higher, they tend to travel a longer distance to district parks. According to the descriptive analysis between utilization factors, people's fear of crime and perception of others were significantly inversely related (rho=.30, p=0.00). As people have lower level of fear of crime when they go to parks, they perceive other park users more positively. Then, eventually, it seems when they feel less threatened, they would travel a longer distance to district parks.

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국문초록

공공시설의 접근성과 이용도의 상관성에 관한 연구, 텍사스주 오스틴의 공립공원의 경우

조 춘 만

※ 키워드 : 공공시설, 공립공원, 공원이용도, 접근성, 지리정보시스템

일반적으로, 공원이용에는 서비스의 질뿐만 아니라 접근성 역시 중요하다 본 연구는 공립공원의 접근성이 이용도에 미치는 영향에 관해 분석하였다. 연구의 전제로서 공원의 질에 해당하는 부분, 즉 운영정책, 광고/마케팅, 이용요금, 서비스의 수준 등은 실험지역(오스틴시)의 모든 공원이 동일하다고 가정함으로써 공원의 접근성과 이용도간 관계만을 분석하였다.

과거의 공원배치는 관례상 하향식 접근방식(top-down approach), 즉 배치의 공정성(equity)을 지향함에 있어 실제 주민들의 공원 수요(needs)나 이용 경향(tendencies) 등을 크게 고려하지 못해왔다. 그러나 본 연구는 설문기반 실제 주민들이 보여주는 공원 이용요소(utilization factors), 즉 사회적 요소(social factors) 및 공원이용패턴(utilization patterns)을 통한 상향적 접근방식(bottom-up approach)의 필요성을 역설코자 하였다.

분석과정에서 공원접근성이 이용도에 직접적 영향을 미치는가에 대하여는 통계를 통한 일반화가 불가능했다. 각 개인은 주이용 공원군(a set of parks)을 설정해 가까운 공원을 더 자주 사용하고 있는 반면, 오스틴 전체이용자를 대상으로 분석해 본 결과로는, 반드시 높은 접근성이 공원으로의 이용도를 높이는 것은 아니었다. 따라서 본 연구는 문헌을 통해 밝혀진 공원 이용요소들을 집적하여, 공원접근성과 이용도간 관련성을 설명하는데 중간요소(mediating factor)로 설정했다. 다변량회귀분석을 통해 실제 주민의 이용 공원까지의 거리에 영향을 미치는 요소들을 이들 중간요소들 가운데에서 추출하였다.

분석결과에 의하면, 사회적 요소들 가운데는 ‘인종’, ‘거주기간’, ‘아동과 동거여부’가 공원접근성과 이용도를 설명하는 유효한 변수였으며, 한편 공원이용패턴 변수들 가운데 ‘교통편’, ‘허용가능 최대여가시간’, ‘여가시간 용이함의 정도‘, ‘공원관련 정보의 양‘, ‘타 공원이용자들에 대한인식" 역시 유효한 변수였다. 흥미롭게도, 각 공원 타입에 해당하는 공원으로의 이용거리를 분석해본 결과, 모든 공원 이용요소들이 모든 유형의 공원으로의 이용거리에 동일한 영향을 미치고 있지는 않았다. 즉, 공원 타입(광역공원, 그린밸트, 금렵지구, 지구공원, 특별공원, 근린공원)에 따라 실제주민이 선택해 이용하는 공원으로의 이용거리에 영향을 미치는 공원 이용요소들은 상이했다.