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# Studies on Usage Patterns and Use Range of Neighborhood Parks: Focused on 'Regional Area Parks' in Seoul, Korea

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## Abstract

Parks are some of the most important spaces within a city and should be managed with practical standards and an efficient system. The current urban park systems however, have inflexible standards where parks are categorized by size alone. In this sense, this study focuses on (1) the provision of practical urban park management schemes and (2) suggestions regarding the adequate use range of parks using a set of empirical data. This study has (1) examined the problems of the current park management and supply system by which parks with varying attributes (such as size, characteristics, and usage) are considered and managed as a single hierarchy and has (2) investigated the use range of five parks in Seoul where the service area has not been clearly defined. Surveys were also conducted to gather information on park usage, and analyses were followed to verify if park usage had statistically significant differences by parks and hierarchy.

The findings of this study identified that the current hierarchy of regional area parks includes both neighborhood parks and regional parks in the same manner. It is expected that the results of this study may be used in suggesting the problems of the current urban park management scheme as well as primary data to consider establishing practical policies.

**Keywords:** regional area park; urban park; neighborhood park; use range; use pattern

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## 1. Introduction

Urban green space is one of the most important spaces for citizens' leisure, recreation, and rest. And it functions as a critical indicator when evaluating a city's amenities and quality (Nam and Kim, 2014). Despite the importance of these aspects, the criteria for the operation and installation of parks have not been sufficiently considered in Korea.

According to the Act on Urban Parks, Greenbelts, etc., regional area parks are classified as one criterion despite differences in size and nature. The character and scheme of the Act is similar to that in Japan. However it is not clear whether these standards are appropriate for the situation in Korea. Furthermore, existing studies on the usage range of urban parks are not enough. Therefore, the purpose of this study is to lay the foundation for more practical and effective neighborhood park supply standards than the existing uniform criteria on the basis of the distribution and

behavior of actual park users. With this, we discuss the problems of the current neighborhood park management system, provide basic data for future installation standards and establish management practices for neighborhood parks in Seoul.

The methods of the present study for determining the use range and installation criteria of regional area parks are as follows.

First, collect parks characteristics affecting the use and various parameters indicating the characteristics of target parks (area, forest area, number of administrators, annual number of visitors, number of facilities, facility types, amenities, and sports facilities). In addition, using these variables, conduct a cluster analysis of 70 target regional area parks in Seoul.

Second, extract representative parks from all the parks through the cluster analysis. The target parks represent the characteristics of the park clusters of the study.

Third, conduct a visitor survey at target parks to identify the use situation of the park. From the survey data, identify the user characteristics, usage patterns, and distribution of park users.

Lastly, derive each cluster's usage range and the appropriate usage range of overall regional area parks by using surveyed data. Additionally, by reviewing the utilization characteristics of park visitors, present the

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implications of the supply and management of future urban neighborhood parks.

## 2. Definition of Urban Park

As open spaces are located in urban areas, urban parks function as places for relaxation, amusement, and various experiences. (Oh, 2005). Eckbo (1950) defines urban park as a place for citizen's sightseeing, walking, exercise, social activities and other emotional activities. As a key ingredient influencing the sustainability of a city (Chiesura, 2004), urban parks support people's active outdoor behaviors (Shim *et al.*, 2006). Furthermore, due to a rising interest in environmental problems, the role of parks in city environment such as reducing urban temperatures has been considered lately (Gallo *et al.*, 1993; Ali, 2008).

According to Korean law, "urban natural park areas" refers to areas designated in Article 38-2 of the National Land Planning and Utilization Act, which are designated according to urban management plans with the purpose of improving the urban scenery by preserving or improving the natural environment and preventing environmental pollution and natural disasters in urban areas.

In addition, the Act on Urban Parks, Greenbelts, etc. defines urban parks as areas that are built or designated to contribute to the protection of natural scenery and improve the health, recreation, and aesthetic enjoyment of citizens in urban areas.

## 3. Study Area

Based on 2014 data, neighborhood parks in Seoul comprise 262 parks, including nine metropolitan area parks, 70 regional area parks, 56 walking parks, and 262 vicinity parks (Table 1.).

Table 1. Classification of Neighborhood Parks

	Definition	Scale standard	Main activities	Number	Influence range
Vicinity parks	Neighborhood park for the use of people living nearby.	Over 1 ha	Daily outdoor activities	262	500m
Walking parks	Neighborhood park for the use of people living within walkable area	Over 3 ha	Weekend outdoor activities	56	1000m
Regional area parks	Neighborhood park for comprehensive use of all people living in regional area.	Over 10 ha	Comprehensive use	70	No Limitation
Metropolitan area parks	Neighborhood park for use of broad-based area over one regional city area.	Over 100 ha	Regional use	9	

Among them, vicinity parks (500m) and walking parks (1,000m) have clear usage ranges specified by law. On the other hand, in the case of metropolitan area parks, the usage range and use targets are considered beyond urban areas. Therefore, this study deals with the spatial range of regional area parks only.

Among the 70 regional parks in Seoul, 55 regional parks were selected as the target of the study, and the remaining 15 parks with admission fees or parks that are defined as historic places, such as palaces and cemeteries, were excluded.

To determine the factors representing characteristics of regional parks, the present study selected some variables based on existing studies. Many studies considered and selected various variables of urban parks' characteristics representing park's statement and condition. Kim *et al.* (2007) reported the importance of facilities in urban parks with regard to user psychological state and park amenities. Ham (2009) clarified the correlation among complexity of park facilities and park use. A large proportion of visitors drive to regional parks (Son and Yoon, 2002; Manross, 2008). As legally defined, regional parks are not limited to neighborhood residents. From this perspective, parking areas for driving visitors are worth considering. In addition, population and number of workers existing near the target parks are conducted to estimate the present condition of location. Table 3. shows some variables used in previous studies.

The 12 variables used in this study are: park area, annual number of users, convenience facilities area, cultural facilities area, number of parking lots, neighborhood residential population, neighborhood working population, number of adjacent subway stations, number of adjacent bus routes, bicycle road connections, number of toilets, and exercise facilities. All data were collected from 2014 Statistical Office data (Table 2.).

Table 2. Variables

Variable	Mean value	Unit
Park area	290563	m <sup>2</sup>
Number of annual users	1071.64	1,000 persons
Convenience facilities Area	263.02	m <sup>2</sup>
Cultural facilities area	1194.93	m <sup>2</sup>
Number of parking lots	59.13	Unit
Neighborhood residential population	42444.51	Person
Neighborhood work population	19205.29	Person
Adjacent subway station number	1.42	Unit
Adjacent bus route number	4.71	Unit
Connecting bike road	0.42	Y/N
Toilet	3.65	Unit
Number of exercise facility	17.44	Unit

Based on the collected variables, cluster analysis was performed to select the survey targets among the 55 parks. As a result of nonhierarchical cluster analysis using the normalized data, five clusters with some

different characteristics were chosen. Table 4. shows the results of the cluster analysis.

By calculating the sum of Z-scores of each variable, five target parks for survey with median sum value of score were selected from each of the clusters. The selected target parks are Hyochang (A), Odong (B), Seoul Forest (C), Forest of citizens (D), and Seonyudo (E).

Table 3. Considered Variables in Previous Studies

Variable	Yang (2008)	Kim (2001)	Nam & Kim (2014)	Ham (2009)	Hong & Park (2003)	Lee <i>et al.</i> (2011)
Park area	V	V	V	V	V	V
Number of facilities (facility types)	V		V	V		
Facility area			V	V		
Number of metro stations			V	V		
Number of bus stations	V		V			
Satisfaction level		V				
Nearest public transportation	V					
Number of adjacent roads	V					V
Population	V		V	V	V	
Slope		V	V			V
Area of urbanization district						V
Elevation			V			V

#### 4. Data: Survey

Targeting the actual users of five parks, surveys were performed. The surveys were conducted over a period of 2 months between May 1 and June 30, and the survey time was from noon to 6 pm. The number of surveys per park was 150. The survey performed for each park was divided into weekdays and weekends at

the same rate. Surveys were conducted throughout the afternoon. According to previous research, the majority of people mainly use parks in the afternoon on both weekdays and weekends (Kim and Hur, 1992; Kim and Yoon, 2003; Park and Kim, 2010; Kim and Shin, 2003).

The questionnaires include basic personal information, such as gender, age, occupation, and car ownership and questions regarding park visit use, such as way of visiting the park, distance from origin, visit frequency, retention time, and purpose of park visit.

In particular, the "distance from origin" question led respondents to provide the actual address of origin and enabled the determination of the straight-line distance from the origin to the park.

#### 5. Analysis: Method and Respondent Characteristics

The analysis methods of the present study for determining the problem with the current classification scheme and deriving the appropriate use range of the regional area park are as follows:

Preferentially, by aggregating the survey data, derive the general use range of the regional area park and each target park. Subsequently, determine differences in usage patterns and use range between parks. Additionally, determine differences in the use range depending on the usage patterns of the user.

A total of 738 valid copies of the survey were confirmed, comprising 145 parts for Hyochang Park, 147 parts for Forest of Citizens, 150 parts for Odong Park and 148 for Seoul Forest, and 148 parts for Seonyudo.

The configuration of respondents shows 413 males (56%) and 325 females (44%). The age of respondents comprised 6.6% teenagers (the fewest) and 25.5% in their twenties (the most). Regarding methods for visiting parks, walking was the most common (44.7%), followed by metro (29.1%), bus (12.6%), and bike (1.4%). The surveys showed that respondents visit the park mainly on weekdays (17.5%), weekends (37.8%),

Table 4. Clusters and Characteristics

Cluster	Components	Features
1	Eungbong, Hyochang, Bonghwa, Gaeunsan, Ssangmun, Yeongchuksan, Galhyeon, Sungsan, Yongwang, Gyeonam, Gguengogae, Bongjesan, Gaeungsan, Noryangjin, Sangdo, Kkachisan, Seorypull, Maljukgeori, Bangbae, Dogok, Songpa Naru, Ogum, Chunma, Jangji, Myeongil	A small number of users, Many neighborhoods population
2	Jungnang camping forest, Odong	Great convenience facilities area, A small number of users, Small neighborhood population
3	Forest of citizens, Yeoido	Many bus routes connect, Many neighborhoods population Many users
4	Boramae, Seoul forest, Dream forest of northern Seoul, Children's grand park	A large park area, Many users, A large area of cultural facilities, Many neighborhoods population
5	Naksan, Doknip, Seonyudo, Sajik, Samchung, Waryong, Baebongsan, Dapsimni, Seongbuk, Bulgwang, Sinsa, Gungdong, Gallsan, Wujiang, Gungsan, Yeomchang, Gaewha, Gocheok, Janggunbong, Dalteo, Syegok, Godeok	A small park size, Small neighborhood population, Less bus routes connect

and regardless of weekends or weekdays (44.6%). Additionally, the visiting time of people was mostly from noon to 3 pm (66.5%) and 3 pm to 6 pm (42.0%). Respondents who visit parks before noon or late at night were fewer than 17%. Additionally, the survey time of this study was considered appropriate.

As a purpose of visiting, 57.9% of people visit parks for relaxation and walking. Additionally, 24% visit for exercise, 1.5% for sightseeing, and 5.3% for educational purposes. Furthermore, 0.7% visit for using cultural facilities, 7.9% for meeting people, and 2.7% for other purposes, such as passing through.

## 6. Analysis: Use Range

The use ranges of the park were derived through a survey (Table 5.). Five parks (Hyochang [A], Odong [B], Seoul Forest [C], Forest of Citizens [D], and Seonyudo [E]) showed wide use ranges of at least 224m and up to 47,900m. This can involve a very wide range from a nearby residence of the park to city outskirts.

The park that has the largest use range is Seonyudo Park, with a mean range of approximately 10,466m, and the smallest is Odong, with a value of 1,104m.

In addition, the Forest of Citizens showed 9,339m, Hyochang showed 1,514m, and Seoul Forest showed a mean distance of 10,198m.

Table 5. Use Area of Target Parks

	N	Mean (m)	Standard deviation	Min. (m)	Max. (m)
A	145	1514.01	2898.98	224	16100
B	150	1104.28	4329.14	268	39550
C	148	10198.45	9460.91	260	36500
D	147	9339.34	8588.45	275	47900
E	148	10465.98	8145.03	515	33500
Sum	738	6526.28	8334.14	224	47900

The average of all target parks' use range was found to be around 6,526m. A range of 6.5km is significantly greater than the range of 500m of vicinity neighborhood parks and 1,000m for walking neighborhood parks.

Regional area parks which are the subject of this study, have a distinct personality and hierarchies from vicinity and walking parks. In addition, their use range is very different, too.

Although in the same hierarchy, target parks' use range obtained through the actual park survey showed very different values.

Therefore, ANOVA (Analysis of Variance) was performed to uncover the differences between the use ranges of each target park. In the analysis results, a significant difference in the use range of each park was shown in the ANOVA analysis (Table 6.).

Table 6. Analysis of Variance (ANOVA)

	Sum of squares	df	Mean square	F	Sig.
Regression	1.351E10	4	3.377E9	65.694	.000
Residual	3.768E10	733	5.141E7		
Total	5.119E10	737			

Then, testing the homogeneity of dispersion and a post-test were performed. In the test results, the LEVENE statistic was 71.378, and the significant probability was 0.000, which showed less than the 95% confidence level value of 0.05. This can be interpreted as a rejection of the null hypothesis, which assumed equal variance between groups (Table 7.). Thus, Dunnett T3 manner was subjected to a post-test (Table 8.)

Table 7. Test of Homogeneity Dispersion

Levene statistics	df1	df2	Sig.
71.378	4	733	.000

Table 8. Multiple Comparisons of Post-test

(I)	(J)	Average difference (I-J)	Sig.	95% Confidence intervals	
				Min.	Max.
A	D	-7825.3332*	.000	-9944.717	-5705.950
	B	409.7269	.983	-797.309	1616.763
	C	-8684.4390*	.000	-10991.290	-6377.588
	E	-8951.9728*	.000	-10966.822	-6937.123
D	A	7825.3332*	.000	5705.950	9944.717
	B	8235.0601*	.000	5996.811	10473.309
	C	-859.1058	.995	-3825.598	2107.386
	E	-1126.6396	.941	-3875.225	1621.946
B	A	-409.7269	.983	-1616.763	797.309
	D	-8235.0601*	.000	-10473.309	-5996.811
	C	-9094.1659*	.000	-11510.447	-6677.884
	E	-9361.6997*	.000	-11501.431	-7221.969
C	A	8684.4390*	.000	6377.588	10991.290
	D	859.1058	.995	-2107.386	3825.598
	B	9094.1659*	.000	6677.884	11510.447
	E	-267.5338	1.000	-3161.612	2626.544
E	A	8951.9728*	.000	6937.123	10966.822
	D	1126.6396	.941	-1621.946	3875.225
	B	9361.6997*	.000	7221.969	11501.431
	C	267.5338	1.000	-2626.544	3161.612

As a result, at the 95% level of confidence, Hyochang (A) showed a statistically significant difference to Seoul Forest (C), Forest of Citizens (D), and Seonyudo (E), and Odong (B) also showed a difference to these three parks. However, between Odong (B) and Hyochang (A) and among Seoul Forest (C), Forest of Citizens (D), Seonyudo (E), a significant difference was not shown.

In sum, the five regional area parks should be clearly divided into two groups. One group is Odong (B) and Hyochang (A), and the other is Seoul Forest (C), Forest of Citizens (D) and Seonyudo (E).

## 7. Analysis: Group Differences

Based on the difference of use areas among the parks, five targets were divided into two groups (GROUP A: Odong, Hyochang; GROUP B: Seonyudo, Seoul Forest, Forest of Citizens) and the difference of characteristics was explored.

The behavior and character of the two groups, which have distinctly different use ranges, are thought to be different and prove that there is a problem in the park



classification scheme that is currently being managed and supplied in one hierarchy.

In this step, the t-test was used to evaluate the differences in the usage patterns of the two groups. The analysis was conducted in a way that tested the difference between the two groups' users' patterns for gender, age, visiting methods, frequency of visits, time spent visiting, residence time, purpose of the visit, and distance from origin. The results of the analysis are shown in Table 9. and Table 10.

The analysis results revealed that statistically significant differences in age, visiting methods, frequency of visits, time spent visiting, residence time, purpose of visit, and distance between the two groups.

As a result, group A, which has a small use range, has higher user ages, more users visiting on foot, high visit frequency, shorter time taken to visit, and more visitors who have the purpose of relaxation, walking, and exercising compared with group B.

This means that parks in group A can be judged as having the characteristics of vicinity area or walking area parks rather than regional attributes.

In the case of B, on the other hand, users have more various purposes and longer use time and a wide range of ages and distance. It can be said that these parks have more regional characteristics.

In fact, group B, including Seonyudo, Seoul Forest, and Forest of Citizens, showed 10,003m of average use range in accordance with the users' origin distribution, whereas group A, composed of Odong and Hyochang, showed 1,306m of average use range, which is approximately one seventh of the range only.

Through the previous analysis, it was confirmed that the "regional area park" is a kind of mixture of various parks with different characteristics, use patterns, and use ranges. The current classification system did not reflect the realities of the parks, and it is necessary to understand the park users' attributes to establish realistic and effective park policies for supply and management in the future.

Therefore, in this step, we explore the park use range in accordance with the behavior and characteristics of park users who responded to the survey. To analyze this, we examined a difference in spatial distance of park users according to surveyed attributes of respondents.

Table 10. Independent Sample Test

	Levene's test for equality of variances		t-test for equality of means						
	F	Sig.	t	df	Sig. (2-tailed)	Mean difference	Std. error difference	95% Confidence interval of the difference	
								Lower	Upper
Gender	.001	.979	-.013	736	.989	.000	.037	-.074	.073
Age	17.034	.000	-6.278	558.753	.000	-.877	.140	-1.152	-.603
Method	122.816	.000	17.664	735.941	.000	1.387	.079	1.233	1.541
Frequency	3.154	.076	-13.968	734	.000	-1.613	.115	-1.840	-1.386
Time spent	39.929	.000	15.333	734.299	.000	1.003	.065	.875	1.132
Residence time	.709	.400	5.450	736	.000	.355	.065	.227	.482
Purpose	84.611	.000	3.225	731.350	.001	.432	.134	.169	.696
Distance	277.766	.000	18.592	641.580	.000	8697.0782	467.7797	7778.5140	9615.6425

As a method of analysis, ANOVA using the park use patterns of the respondents as an independent variable and the distance from the origin to the park as the dependent variable was performed. In the results, significant differences in the distance to visit the park were found depending on the visitor's age, visiting methods, and frequency of visits. The results of the analysis are shown in Figs.1., 2., and 3.

Table 9. Paired Samples Statistics

	Group	N	Mean	Std. deviation	Std. error mean
Gender	B	443	.44	.497	.024
	A	295	.44	.497	.029
Age	B	443	3.55	1.676	.080
	A	295	4.44	1.973	.115
Method	B	443	2.63	1.276	.061
	A	295	1.24	.857	.050
Frequency	B	441	2.43	1.499	.071
	A	295	4.04	1.589	.093
Time spent	B	443	2.81	1.054	.050
	A	294	1.80	.722	.042
Residence time	B	443	4.21	.841	.040
	A	295	3.85	.902	.053
Purpose	B	443	2.30	2.257	.107
	A	295	1.87	1.382	.080
Distance	B	443	10002.75	8742.33	415.36
	A	295	1305.67	3695.48	215.16

As shown in Fig.1., a difference was found in the distance between the users who visit on foot (1) or use bikes (4) and cars (5) or public transportation, such as the metro (2) or bus (3). Users who visit the park with vehicles showed a longer distance, which suggests that methods of access to the park can determine the range of park use area. Parks providing well-prepared parking lots or located in areas with good public transport accessibility need to be considered and managed differently to parks located in a residential area with easy access by bike or on foot.

There was a significant difference in use range between age groups using the park. Those in their 20s have the most wide range uses, and it seems as users become older, they use nearer parks. It seems elderly people mainly use nearby parks because of their physical limitations, whereas younger people showed more activity. However, teenagers have a similar use range to the elderly, and it is estimated they have

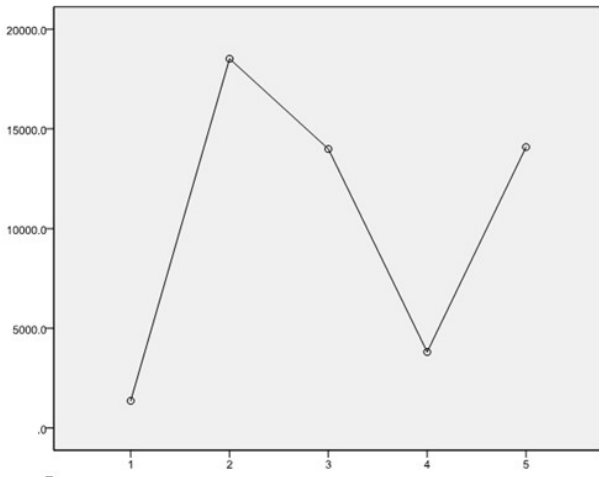


Fig.1. Distance and Methods to Visit

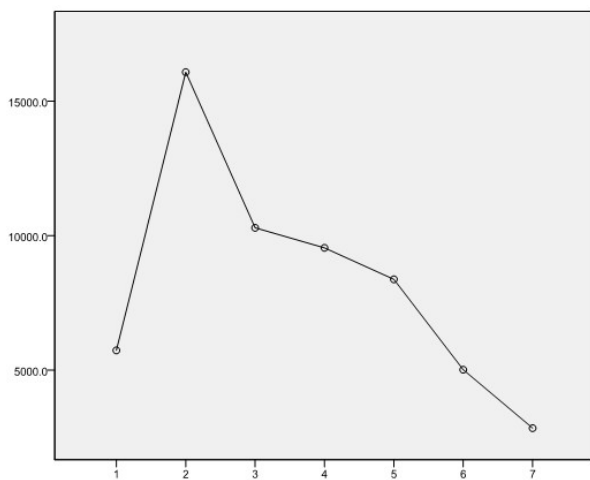


Fig.2. Distance and Age Groups

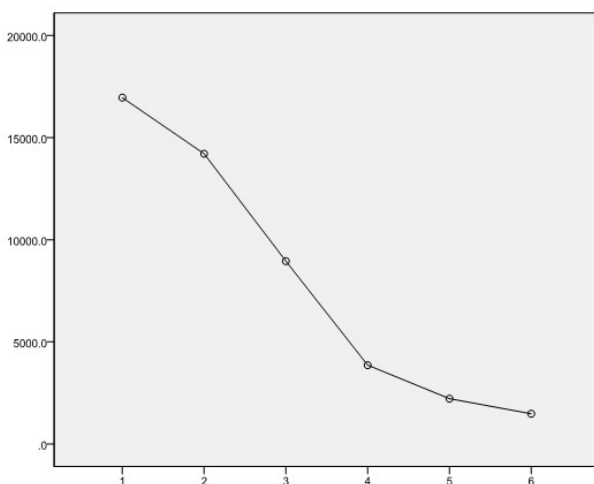


Fig.3. Distance and Visit Frequency

limited activity areas or visit parks with people like their parents.

Distance according to frequency of visits to the park also showed a significant difference among respondents who visit the park one to three times a year (1, 2), once per month (3), and one to five times a week (4, 5, 6). As a result, the users visiting more often

showed shorter use distance. It represents regional area parks' characteristic of containing various types of parks together in one hierarchy.

## 8. Conclusions

This study raises the issue of current neighborhood park policy, which is managed and supplied as a single hierarchy, despite the different size and nature of each park, and it deduces the use range of the targets of five regional area parks (Hyochang, Odong, Seoul Forest, Forest of Citizens, and Seonyudo) through an empirical study.

With this, the target parks were categorized according to computed use range, and some characteristics of regional area parks were identified. The results of the study are as follows.

First, in the results of survey measuring, the use range of total regional park areas was shown to be about 6.5km, which is significantly larger than the 1km of walking area parks' use range.

However, even in the same hierarchy, parks showed different use ranges according to cases. For instance, parks in group A (Hyochang, Odong) showed approximately 1.3km of smaller range compared with group B (Seoul Forest, Forest of Citizens, Seonyudo), having about a 10km range.

Subsequently, we statistically identified that two groups have different use patterns. Compared with group B, group A has a higher visitor age, more walking users, more frequent visitors, and more people who have the purpose of relaxation and exercise. The results represented that some regional area parks have characteristics of daily living zone parks similar to vicinity parks or walking area parks. In contrast, some other parks have more regional characteristics and have broad roles as high-hierarchy facilities.

Finally, differences of use range were verified based on the behavior of park users; as a result, people showed some differences in distance to visit parks according to their visiting methods, ages, and visiting frequency.

To sum up the results of this study, the current regional area park is a mixture of various parks with significantly different characteristics and structures.

In these, heterogeneous parks have differences in the attributes of user patterns, such as visiting purpose and visiting distance.

The current policy of park division that divides one standard park area seems to have some problems. It needs more detailed and realistic criteria to establish a developed management and supply policy in the future.

In addition, in terms of park visitors determining their designated parks, the range of chosen parks have statistically significant differences. This implies that the consideration of the locational features of parks and population characteristics in near areas is required in classifying parks and establishing park management standards. Park usage has differences in accordance

with purpose of park visit, visit frequency, and modes of travel to the park. In consequence, when providing and planning for parks, comprehensive and systematic criteria are required. The criteria should include: purpose, targeted visitor and accessibility, as well as the existing standard – the area of parks.

The limitations of this study may include the following: The target parks comprised a small number of regional area parks, and consequently physical factors that might have effects on park use range could not be statistically derived. In this regard, in order to investigate the factors that affect park use range, qualitative and non-physical parts should also be considered, such as popularity and satisfaction related to urban parks. The significance of this study may include: (1) the use ranges of regional area parks and urban parks were investigated based on the responses from park visitors; and (2) the distance of choosing designated parks according to visitors' usage characteristics were examined to provide statistical verification of the problems of rather inflexible and impractical park management policy. In addition, the results of this study may be used as primary data to consider establishing practical policies.

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