Correlation between Perception of the Physical Environment and Park Use

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Abstract

This study examined the relationship between residents' perceptions of the physical environment of their neighborhoods and their park use to analyze the effect of perception on park use. The neighborhoods and parks selected for the study were located in the Suseong district of Daegu Metropolitan City, South Korea. A total of 559 survey questionnaires were analyzed using variance analysis (Chi-square and T-test) and multivariate logistic regression. An analysis of the residents' perceptions of the physical environment of their neighborhoods showed that park users and non-users differed significantly on a total of 10 assessment items, with park users expressing a higher level of satisfaction with the physical environment of their neighborhoods than non-users. The personal characteristics variables were found to exert a significant influence on park use within a 5% significance level. The health status and physical activity variables were found to exert a significant influence on park use within a 5% significance level. Finally, of the variables pertaining to residents' perceptions of the physical environment of their neighborhoods, "open space opportunity" ($p<0.01$) and "environmental pleasantness" ($p<0.05$) were found to exert a significant influence on park use within a 5% significance level.

Keywords: Park Use; Neighborhood Park; Physical Environment; Environmental Perception

INTRODUCTION

Urban economic progress and improved standards of living have kindled people's interest in better health and health-related quality of life. This increased interest, in turn, has had the effect of pushing the concept of health outside of the domain of the individual and into the social and environmental domains (Lee et al. 2015). Changes in lifestyle shaped by the urban physical environment are exerting a strong influence on individuals' health, and it is in this context that the significance of the physical attributes of urban environments is being stressed (Giles-Corti and Donovan 2002; Pikora et al. 2003; Kim and Kang 2011).

From this standpoint, academics in the fields of urban planning and landscaping have been advocating activity-friendly urban environments and the increased utilization of local parks as hubs for individuals with active lifestyles (Besenyi 2003; Hamilton 2011). Open spaces such as parks and recreation areas should be easily accessible, free to low-cost, and built to promote residents' health and leisure (Youn and Choi 2014; Park et al. 2015). The constant availability of these spaces makes them ideal for those who wish to pursue health through regular physical activity. Nowadays, parks and recreation areas are increasingly considered as facilities capable of helping to alleviate the physical and psychological stress associated with urban lifestyles.

In fact, many studies have reported that park use contributes to increased physical activity (Bedimo-Rung et al. 2005; Cohen et al. 2006) and stress relief (More and Payne 1978; Orsega-Smith et al. 2004). Clearly, various measures should be undertaken to encourage active park use among urban residents. It has recently been reported that not only the physical features of parks and green spaces, but also the physical attributes of neighborhoods can have a crucial effect on residents' park use (Giles-Corti et al. 2005; Cohen et al. 2007; Kaczynski et al. 2008; Coombes et al. 2010). The finding has set in motion further research examining the link between neighborhood environment and park use.

However, studies analyzing the direct correlation between the physical environment of a neighborhood and its residents' park use are still rare. Furthermore, indicators of the physical environment of neighborhoods in the existing literature have been concentrated on spatial indicators such as land use and urban infrastructure density, while indicators pertaining to residents' perceptions of their neighborhood environment and its effect on park use have not been studied adequately. To encourage park use for public health gains, it appears imperative that residents' perceptions of their neighborhoods are examined by incorporating a more diverse and detailed set of physical environmental attributes. To this end, the present study surveyed the residents' of the Suseong district of Daegu Metropolitan City regarding both their perceptions of the neighborhood environment and their local park use in order to identify the influence of perception on park use for the purposes of healthy living.

METHODS

Study Area

The Suseong district of Daegu Metropolitan City study was selected for analysis. The Suseong district, an administrative district located in the southeastern part of Daegu, has a total area of 76.47 km^2 and a total population of 457,976 across its 23 administrative towns (http://www.suseong.kr). Mountains are present along much of the district's eastern and southern borders, and a stream runs from south to north along its western

side. Its downtown area spreads across the south-eastern corner of the district. Of Daegu Metropolitan City's 8 administrative districts, the Suseong district has the largest area of park space per person, at approximately 6.0 m^2 (Daegu 2014). In addition to this, its residents have the lowest BMI in the city (KCDC 2012).

In order to identify the residents' perceptions of their neighborhood and its effect on their park use, the study area was narrowed down to neighborhood parks providing around-

the-clock access, exercise amenities, and walking trails. Of a total of 13 parks and one recreation area located within the Suseong district, only those completed and opened to the public by August 2014 and whose total area exceeded 10,000 m^2 were selected for the analysis. As a result, a total of 6 parks and a single recreation area were included: Jisan Park, Simin Sport Park, Hwarang Park, Maeho Park, Shinmae Park, Nobyeon Park, and the Suseong Recreational Park (Figure 1).
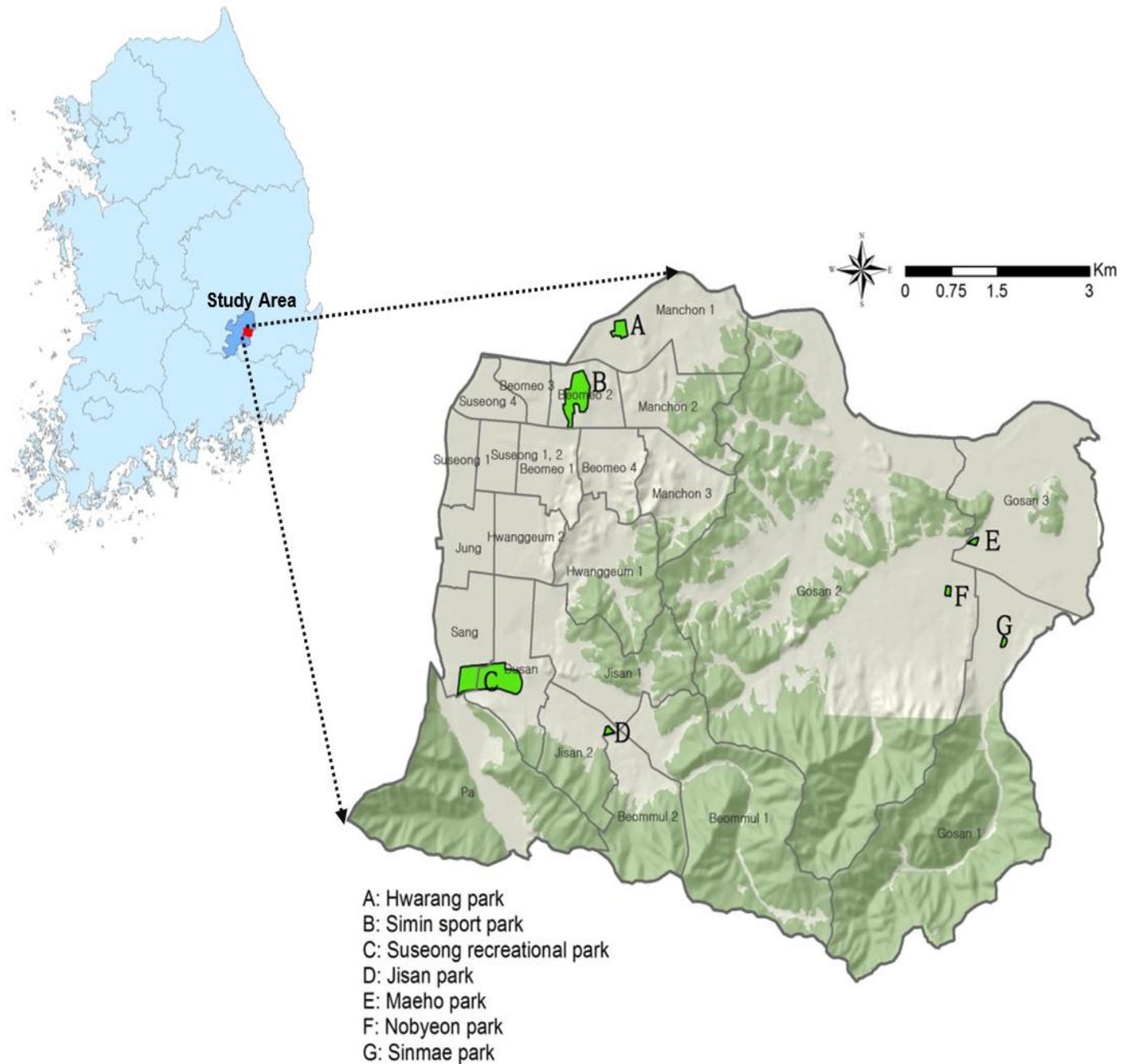

A: Hwarang park
B: Simin sport park
C: Suseong recreational park
D: Jisan park
E: Maeho park
F: Nobyeon park
G: Sinmae park

Figure 1. Location of study area and study parks

Survey Data Collection

The survey was conducted in two phases. The first survey was conducted from August 28-September 13, 2014 regarding Hwarang Park, Simin Sport Park, and the Suseong Recreational Park; while the second survey was conducted from May 23-July 3, 2015 regarding Jisan Park, Nobyeon Park, Maeho Park, and Shinmae Park, as well as the surrounding residential neighborhoods. The residential neighborhoods were selected based on the criterion of being within 800 m of the park, a distance which takes about 10 minutes to cover on foot. To ensure a robust response rate and the reliability of the responses, survey respondents were provided with a full briefing on the questionnaire prior to participating in the one-on-one interview. Each interview was led by a pair of surveyors who consisted of graduate and/or undergraduate students with thorough knowledge of the questionnaire. Of a total of 571 questionnaires collected via the interviews, 559 were used in the analysis following the exclusion of 12 questionnaires with missing responses that were of major significance.

Questionnaire items were divided into the following categories: personal characteristics, park use for healthy living, and perception of the physical environment of the neighborhood (Table 1). Personal characteristics items were designed to assess the respondents' sociodemographic characteristics, physical activity level, and health status. For the items measuring physical activity, KCDC's Community Health Survey items were consulted (KCDC 2012). In terms of the items pertaining to perceptions of the physical environment of the neighborhood, 15 physical environmental indicators were evaluated on 5-point Likert scales. As for the indicators, those observed to be strongly correlated with park use intended for healthy living were selected upon an expert panel meeting based on a literature review of relevant Korean and international publications (Giles-Corti et al. 2005: Hillsdon et al. 2006; Cohen et al. 2007; Kaczynski et al. 2008:

Coombes et al. 2010; Lee et al. 2013; Baek and Park 2014; Park et al. 2014).

Statistical Analysis

Frequency analysis was performed and descriptive statistics were used to identify the respondents' personal characteristics and perceived neighborhood physical environment. Then, a Pearson Chi-square (x^2) test and a T-test were performed to examine the differences in the perceptions of respondents who used the parks for healthy living and respondents who did not. Additionally, a factor analysis using a varimax orthogonal rotation was performed to address the multicollinearity between the indicators of residents' perceptions of the neighborhood environment (10 items) with scores which had been found to vary significantly between park users and non-users. This was also done to improve the efficiency of the analysis by streamlining the indicators that are similar in nature into a few representative indicators.

Subsequently, in order to identify the effect of residents' perceptions of the physical environment of their neighborhoods on their park use, a multivariate logistic regression was performed using park use for healthy living as the dependent variable, with personal characteristics and the perception factors as the independent variables. A statistical model was created in three stages. Model 1 used sociodemographic characteristics as the independent variable. Model 2 expanded on Model 1 with the addition of health status and physical activity variables to the analysis. The final model, Model 3, expanded on Model 2 by adding the perception factors as the independent variable. For the input variables at each stage, the items with scores that had been found to vary significantly between park users and non-users within a 5% significance level were selected. Gender and BMI, which had been found to have a strong correlation with park use in similar previous studies (Lee et al. 2013; Baek and Park 2014), were used as additional input variables.

Table 1. Questionnaire content.

Category		Contents
Personal characteristics	Demographic characteristics	Gender, Age, Average monthly income, Occupation, Dwelling type
	Health status	Health problem (Cardiac disorders, Diabetes etc.), Self-reported health level, Self-reported , BMI
	Physical activity	Walking activity (days walking a week for more than 10 minutes), Moderate physical activity (days doing moderate physical activity a week for more than 10 minutes), Vigorous physical activity (days doing vigorous physical activity a week for more than 10 minutes), Spare time spent sitting
Park use for health living		User, Non-user
Subjective perception of physical environments		Accessibility to marketplace, Availability of public transit, Accessibility to exercise amenities, Accessibility to park, Adequacy of safety and security features, Adequacy of sidewalks, Adequacy of crosswalks and traffic lights, Adequacy of tree shades, Number of crosswalks, Number of passing vehicles, Traffic speed, Volume of physically active residents , Safety from crime, Sidewalk maintenance, Air quality

RESULTS

Analysis of perceived neighborhood environment

Personal characteristics and health status

The 559 survey respondents consisted of slightly more women (54.6%) than men. In terms of age, respondents in their 60s accounted for the majority, at 23.1% of the total; followed by teenagers, at 18.1%; and those in their 40s, at 17.0% (Table 2). As for occupations, a large proportion of respondents were either students or homemakers, at 28.4% and 21.8%, respectively. Respondents with an average monthly household income of 2-4 million KRW accounted for the majority at 41.7%, followed by those whose average monthly household income exceeded 4 million KRW, at 32.1%. As a result, 73.8% of the survey respondents were found to have an average monthly household income of 2 million KRW or more. A large proportion of respondents were highly educated, with 46.6% reporting to have an associate degree or beyond. The majority of respondents (65.7%) reported living in apartment homes. As for the respondents' park use, 348 (62.3%) out of the 559 respondents reported that they frequented the parks for healthy living.

In terms of the respondents' health characteristics, 26.5% reported having a cardiovascular condition and/or diabetes. Less than a quarter (16.3%) of respondents reported using tobacco, whilst more than half (58.8%) reported that they consumed alcohol (Table 3). The respondents' self-reported level of health was averaged at 3.42 points, and their self-reported stress level was averaged at 3.33 points (1 point: very bad, 5 point: very good). As for the average BMI of respondents (which was calculated using self-reported measurements for height and weight) the average was a BMI of 22.12, which falls within the normal range of 18.5-23. In fact, the BMI result was in line with average reported for the Suseong district in the 2012 BMI survey (22.80), which was conducted on the 8 administrative districts in Daegu Metropolitan City by the KCDC (KCDC 2012). In this survey, the Suseong district was the only district which recorded an average BMI within the normal range. In terms of the level of physical activity among the respondents, it was assessed at an average of 4.89 days of walking, 1.85 days of moderate physical activity, and 1.29 days of vigorous physical activity. The length of spare time spent sitting was less than 2 hours for 54.0% of the respondents.

Perception of the physical environment of the neighborhood

The respondents' perception of the physical environment of their respective neighborhoods was measured on a 5-point Likert scale, and all 15 items had a score of 3 points (median score) or above (Table 4). "Availability of public transit" scored the highest at 4.10 points, followed by "accessibility to exercise amenities," "accessibility to parks," and "accessibility to marketplace," at 3.92 points, 3.88 points, and 3.80 points, respectively. On the other hand, "the number of crosswalks" scored the lowest, at 3.10 points, followed by "traffic speed," "the volume of physically active residents," and "air quality" at 3.31 points, 3.32 points, and 3.33 points, each.

Comparison between park users and non-users

Sociodemographic characteristics

A Chi-square analysis performed to examine the differences in sociodemographic characteristics between park users and non-users yielded the following results (Table 2). Age and occupation varied significantly between park users and non-users within a 1% significance level, and dwelling type differed within a 5% significance level. On the other hand, gender, average monthly household income, and education level were not found to vary significantly between the two groups. In terms of age, park users and non-users were fairly equally distributed across the age bracket spanning from teenagers through those in their 30s, but the number of park users began to grow among respondents aged 40 years and older. In fact, 80% of respondents in their 50s and 60s were found to be park users. In terms of occupations, homemakers were by far the most likely group to be park users, with 70% reporting park use, while students were the least likely, with 44.7% reporting that they used their local parks. Of the respondents living in detached or row houses, 69.3% were park users, while 58.3% of those living in apartments reported park use.

Health status and physical activity

Analysis of the difference in health status and physical activity between park users and non-users found the following (Table 3). In terms of health status, health issues and subjective stress levels varied significantly between the two groups within a 1% significance level. In terms of physical activity, the number of days on which respondents spent 10 minutes or more either walking or in vigorous physical activity varied significantly between the two groups within a 1% significance level. The length of spare time spent sitting also varied significantly between the two groups, and it did so within a 5% significance level. In terms of health issues, 77% of the respondents with a cardiovascular condition or diabetes were park users, and 56.9% of the respondents without such conditions were park users. As for subjective stress level, park users had an average score of 3.46 points which represented a relatively low level of stress, whereas non-users had a score of 3.12 points which represented a relatively high level of stress.

The number of days on which respondents walked or engaged in vigorous physical activity for 10 minutes or more marked a similar pattern. Park users engaged in walking exercise for a minimum of 10 minutes on 5.16 days a week on average, and they engaged in vigorous physical activity for a minimum of 10 minutes on 1.48 days a week on average. Non-users were less active, spending 0.7 and 0.52 fewer days on walking and vigorous exercise respectively in a given week. As for the length of spare time spent sitting, 66.7% of the respondents who answered "less than 2 hours" were park users, and 57.4% of those who responded "2 hours or more" were non park users.

Table 2. Bivariate analyses of socio-demographic characteristics between park user and non-user.

Variable	Descriptive statistics (N)	User	Non-user	Chi-square test
Park use (N=559)	Yes: 62.3% (348)	62.3%	37.7%	-
	N: 37.7% (211)			
Gender (N=559)	Male: 45.4% (254)	64.2%	35.8%	x^2=0.730
	Female: 54.6% (305)	60.7%	39.3%	
Age (N=559)	≦10's: 18.1% (101)	43.6%	56.4%	x^2=57.670**
	20's: 15.4% (86)	51.2%	48.8%	
	30's: 12.2% (68)	48.5%	51.5%	
	40's: 17.0% (95)	60.0%	40.0%	
	50's: 14.3% (80)	80.0%	20.0%	
	≧60's: 23.1% (129)	82.2%	17.8%	
Occupation (N=559)	Students: 28.4% (159)	44.7%	55.3%	x^2=42.125**
	Homemakers: 21.8% (122)	76.2%	23.8%	
	Sale workers: 10.9% (61)	52.5%	47.5%	
	Public servants: 5.2% (29)	62.1%	37.9%	
	Professionals: 7.5% (42)	61.9%	38.1%	
	Others: 26.1% (146)	74.0%	26.0%	
Average monthly income (N=535)	<2 million KRW: 26.2% (140)	70.7%	29.3%	x^2=5.626
	2~4 million KRW: 41.7% (223)	60.1%	39.9%	
	≧4 million KRW: 32.1% (172)	58.7%	41.3%	
Education (N=556)	≦Middle school: 25.2% (140)	55.0%	45.5%	x^2=5.242
	High school: 28.4% (158)	67.7%	32.3%	
	≧College: 46.4% (258)	63.2%	36.8%	
Dwelling type (N=559)	Detached & row house: 32.0% (179)	69.3%	30.7%	x^2=7.373*
	Apartment: 65.7% (367)	58.3%	41.7%	
	Others: 2.3% (13)	76.9%	23.1%	

*p≤0.05, **p≤0.01

Table 3. Bivariate analyses of health status and physical activity between park user and non-user.

Variable		Descriptive statistics (N)	User	Non-user	Bivariate test[+]
Health status	Health problem (Cardiac disorders, Diabetes etc., N=559)	Yes: 26.5% (148)	77.0%	23.0%	x^2=18.695**
		No: 73.5% (411)	56.9%	43.1%	
	Smoking (N=559)	Yes: 16.3% (91)	64.8%	35.2%	x^2=0.308
		No: 83.7% (468)	61.8%	38.2%	
	Drinking (N=558)	Yes: 58.8% (328)	60.4%	39.6%	x^2=1.122
		No: 41.2% (230)	64.8%	35.2%	
	Self-reported health level (N=559)	3.42±0.81	3.41	3.44	t=-0.393
	Self-reported stress level (N=559)	3.33±0.97	3.46	3.12	t=4.070**
	BMI (N=552)	22.13±2.77	22.17	22.01	t=0.768
Physical activity	Walking activity (days, N=557)	4.89±2.18	5.16	4.46	t=3.715**
	Moderate physical activity (days, N=559)	1.85±2.33	1.99	1.62	t=1.921
	Vigorous physical activity (days, N=556)	1.29±2.00	1.48	0.96	t=3.003**
	Spare time spent sitting (N=556)	<2 hours: 54.0% (300)	66.7	33.3	x^2=5.032*
		≧2 hours: 46.0% (256)	57.4	42.6	

*p≤0.05, **p≤0.01, [+]x^2: chi-square test, t: T-test

Perception of the physical environment of the neighborhood

The T-test performed to examine the differences between the perceptions of park users and non-users regarding the physical environment of their neighborhoods yielded the following results (Table 4). A total of 10 of the 15 items were found to vary significantly between the two groups within a 1% significance level, with park users being more satisfied with the physical attributes of the neighborhood than non-users, as observed across all 10 items. The respondents' satisfaction levels pertaining to "the volume of physically active residents" and "accessibility to the park," in particular, varied greatly between park users and non-users, by 0.50 points (t=6.320) and 0.44 points (t=0.6125), respectively. The respondents' satisfaction levels regarding "air quality (t=3.727)" and "accessibility to exercise amenities (t=3.728)" also varied greatly between park users and non-users. However, 5 survey items including "accessibility to marketplace" and "availability of public transit" did not vary greatly between the two groups.

Correlation between perceived neighborhood physical environment and park use

Typology of perceptions of the physical environment

A correlation analysis was performed regarding the 10 items pertaining to residents' perceptions of the physical environment of their neighborhoods, which had been found to vary between park users and non-users. The results indicated that all items were highly correlated with each other within a 1% significance level. Based on this finding, a factor analysis was performed to address the multicollinearity issue, and to extract the factors that can represent items similar in nature (Table 5). The analysis found a high KMO (Kaiser Meter Olkin) value of 0.893, and Bartlett's test of sphericity found that common factors existed within a 1% significance level.

The typology streamlined the items into three factors, and the relatedness between the items was found at 0.4 or above across all 10 items, indicating a fairly high level of explained variance. Factor 1 included "adequacy of crosswalks and traffic lights," "adequacy of sidewalks," "adequacy of tree shades," and "adequacy of safety and security features," and because these were considered to be physical features that were conducive to walking behavior, factor 1 was named "pedestrian convenience." Factor 2 consisted of "sidewalk maintenance," "air quality," and "safety from crime," and because these appertained to a clean and safe neighborhood environment, factor 2 was named "environmental pleasantness." Factor 3 included "accessibility to park," "accessibility to exercise amenities," and "Volume of physically active residents," and because these were considered to represent the accessibility to parks and other exercise amenities, factor 3 was named "open space opportunity."

Table 4. Bivariate analyses of neighborhood environmental perception between park user and non-user.

Neighborhood environmental perception	Descriptive statistics		User	Non-user	*t*
	Mean	S.D.			
Accessibility to marketplace (N=559)	3.80	0.87	3.81	3.77	0.539
Availability of public transit (N=559)	4.10	0.85	4.07	4.15	-1.122
Accessibility to exercise amenities (N=559)	3.92	0.83	4.02	3.75	3.728**
Accessibility to park (N=558)	3.88	0.85	4.05	3.61	6.125**
Adequacy of safety and security features (N=557)	3.57	0.92	3.66	3.41	3.084**
Adequacy of sidewalks (N=559)	3.72	0.86	3.81	3.58	3.016**
Adequacy of crosswalks and traffic lights (N=559)	3.73	0.83	3.80	3.60	2.815**
Adequacy of tree shades (N=559)	3.51	0.93	3.61	3.35	3.261**
Number of crosswalks (N=559)	3.10	0.88	3.08	3.14	-0.781
Number of passing vehicles (N=559)	3.57	0.92	3.61	3.50	1.393
Traffic speed (N=559)	3.31	0.92	3.37	3.22	1.839
Volume of physically active residents (N=559)	3.32	0.95	3.51	3.01	6.320**
Safety from crime (N=559)	3.43	0.86	3.50	3.31	2.615**
Sidewalk maintenance (N=559)	3.46	0.85	3.56	3.30	3.607**
Air quality (N=559)	3.33	0.92	3.44	3.15	3.727**

*p≤0.05, **p≤0.01

Table 5. Typology of perception variables on the physical environment.

Category	Factor 1	Factor 2	Factor 3	Communality
Adequacy of crosswalks and traffic lights	0.855	0.189	0.074	0.772
Adequacy of sidewalks	0.815	0.156	0.225	0.739
Adequacy of tree shades	0.667	0.222	0.292	0.579
Adequacy of safety and security features	0.656	0.202	0.353	0.596
Sidewalk maintenance	0.281	0.81	0.109	0.747
Safety from crime	0.274	0.772	-0.046	0.674
Air quality	0.068	0.756	0.254	0.641
Accessibility to park	0.241	0.106	0.824	0.749
Accessibility to exercise amenities	0.340	0.049	0.803	0.763
Volume of physically active residents	0.089	0.475	0.534	0.518
Percentage of variance (%)	44.358	13.353	10.064	-
KMO measure of sampling adequacy	0.862			
Bartlett's test of sphericity	0.000			

Table 6. Odds of neighborhood environmental perception influencing park use for health improvement.

Variables			Model 1		Model 2		Model 3	
			Odds ratio	95% C.I.	Odds ratio	95% C.I.	Odds ratio	95% C.I.
	(Constant)		1.861		4.734		4.127	
Personal characteristics	Gender	male		-		-		-
		female	0.684	0.453-1.033	0.563*	0.353-0.899	0.605*	0.370-0.988
	Age	< 10's		-		-		-
		20's	1.356	0.757-2.427	1.970*	1.042-3.727	2.552**	1.293-5.035
		30's	0.998	0.527-1.892	2.081*	1.005-4.310	3.279**	1.505-7.143
		40's	1.468	0.796-2.709	3.105**	1.513-6.371	3.817**	1.793-8.126
		50's	4.150**	2.075-8.297	8.125**	3.585-18.413	10.125**	4.227-24.253
		≥60's	4.422**	2.362-8.276	4.976**	2.438-10.157	7.048**	3.282-15.135
	Occupation	non-homemaker		-		-		-
		Homemaker	2.207**	1.234-3.946	2.227*	1.092-3.915	2.067*	1.092-3.915
	Dwelling type	house		-		-		-
		apartment	0.656*	0.442-0.975	0.739	0.404-0.983	0.630*	0.404-0.983
Health status & Physical activity	Health problem	non-existence				-		-
		existence			0.436**	0.252-0.786	0.445**	0.252-0.786
	Self-reported stress level				1.385**	1.028-1.619	1.290*	1.028-1.619
	BMI				0.908*	0.838-1.001	0.916	0.838-1.001
	Walking activity				1.187**	1.072-1.312	1.186**	1.072-1.312
	Spare time spent sitting	< 2 hours				-		-
		≥2 hours			0.602*	0.370-0.854	0.562**	0.37-0.854
Neighborhood environmental perception	Pedestrian convenience						1.206	0.983-1.481
	Environmental pleasantness						1.290*	1.043-1.596
	Open space opportunity						1.787**	1.449-2.205
Chi-square(x^2)			71.865**		113.325**		151.347**	
R^2			16.4%		25.50%		33.1%	

*$p<0.05$, **$p<0.01$

The effect of residents' perceptions of the neighborhood on park use

A 3-step logistic regression was performed to analyze the effect of residents' perceptions of the physical environment of the neighborhood on their park use. The Chi-square values, which represent the fitness of the models, were found to be significant within a 1% significance level at each stage of the regression (Table 6). The explanatory power (Nagelkerke R2) of the models was found to increase at each stage of the regression, from 16.4% to 25.5%, and then to 33.1%.

Regarding personal characteristics of model 3, age exerted a significant effect on park use within a 1% significance level, while gender, occupation, and dwelling type exerted a significant effect on park use within a 5% significance level. Park use was more popular among older respondents. In fact, park use among respondents in their 50s was 10.125 times (OR=10.125) greater than it was among respondents in their teens. The likelihood of park use was also higher among men (OR=0.605), homemakers (OR=2.067), and those who resided in detached or row houses (OR=0.630).

In terms of health status and physical activity, health issues, the number of days walked, and the length of spare time spent sitting were found to exert a significant effect on park use within a 1% significance level, while perceived stress was found to do the same within a 5% significance level. Further, it was found that BMI (p=0.051) was correlated with park use within a 10% significance level. Healthy respondents were 2.246 times (OR=0.445) more likely to be park users than respondents with cardiovascular conditions or diabetes. It was also found that respondents who walked more frequently (OR=1.186) were more likely to be park users, whilst those with higher subjective stress levels (OR=1.290) and those who spent more time sitting (OR=0.562) were less likely to be park users.

In terms of residents' perceptions of the physical environment of the neighborhood, it was found that "open space accessibility" exerted a significant effect on park use within a 1% significance level. "Environmental pleasantness" was also found to exert a significant effect on park use, within a 5% significance level, whilst "pedestrian convenience" (p=0.73) had an effect within a 10% significance level.

DISSCUSSION

A comparison between park users and non-users found that homemakers in their 50s or older who lived in detached or row houses were the most likely respondents to be park users, whilst students and workers in their 20s and 30s who lived in apartment homes were most likely to be non-users. These results may be attributed to the following facts. Homemakers in their 50s tend to have a greater amount of leisure time than students or working people in their 20s and 30s (Moon 2006; Park et al. 2014). Individuals living in detached houses are more likely to frequent the parks as their immediate outdoor surrounding tends to offer little space and fewer features supportive of physical activity, relative to apartment complexes. A comparison of physical activity levels between the two groups indicated that park users engaged in walking

exercise or other vigorous physical activities more frequently than non-users. Relative to non-users, park users also had a lower level of stress. These results may be due to the stress relieving effect of park use-associated physical activity. In fact, it has been verified in previous studies that park use is associated with increased physical activity (Cohen et al. 2006; Bedimo-Rung et al. 2005) and reduced negative emotions such as anxiety (Orsega-Smith et al. 2004; More and Payne 1978), thereby relieving stress and reducing depressive symptoms (Ho et al. 2003). Relative to non-users, park users expressed a higher level of satisfaction with what their neighborhoods have to offer in terms of parks and other exercise amenities. On the other hand, non-users were less satisfied than park users regarding the overall environment of the neighborhoods, including the volume of physically active residents and air quality.

Results pertaining to the effect of residents' perceptions of the neighborhood environment on park use suggested that increased interest in maintaining good health, coupled with increased leisure time (typically following retirement), tended to drive up the rate of park use in older respondents. These results supported the findings of previous studies (Lee et al. 2013; Park et al. 2014). However, the rate of park use among respondents aged 60 years and older was slightly lower than that among the respondents in their 50s. This is thought to be attributed to age-related diminishment of physical function, which makes the park environment less appealing for older respondents (Oswald et al. 2007; Kang et al. 2011; Kim 2012). The respondents with cardiovascular diseases or diabetes had a low likelihood of park use, which suggested a link between poor health and a lack of park use. The likelihood of park use increased as respondents' walking activity increased and as sitting time decreased, which may suggest that park use contributed to increased physical activity. This finding supports those found in previous studies conducted by Cohen et al. (2006) and Bedimo-Rung et al. (2005).

The likelihood of park use also increased with increasing proximity or accessibility to the park. Similar results were found in studies by Coombes et al. (2010) and Parks et al. (2014). Park use also tended to increase as respondents' perceptions of the proportion of active residents in their neighborhoods increased, suggesting that seeing more people engaged in healthy physical activity could spark inspiration for increased park use such as previous studies (Stahl et al. 2001; Baek and Park 2014). Therefore, it is thought that the more conducive that a given neighborhood environment can be made to walking - for example, by ensuring clean air and well-maintained pedestrian safety features - the more positive residents' perceptions of the physical environment of their neighborhood is likely to be, and the more likely they will be to use local parks.

CONCLUSION

This study examined the differences between the personal characteristics, health statuses, physical activity levels, and perceptions of the neighborhood environment of users and non-users of neighborhood parks located in the Suseong district of Daegu Metropolitan city in South Korea, in order to

identify the effect of residents' perceptions of the physical environment of their neighborhood on their park use.

The major findings of the present analysis include the following. In terms of personal characteristics, park users and non-users differed significantly in age, occupation, and dwelling type. In terms of physical activity level and health status, park users and non-users differed significantly regarding health issues, subjective stress levels, the number of days walked, the number of days engaged in vigorous physical activity, and the length of spare time spent sitting. In terms of the differences between the perceptions of park users and non-users regarding the physical environment of their neighborhoods, a total of 10 items differed significantly between the two groups, with park users being more satisfied with the neighborhoods' offerings than their counterparts who did not use the parks.

Employing a typology of the items pertaining to residents' perceptions of the physical environment of their neighborhoods was able to streamline the 10 items into 3 factors, which included "pedestrian convenience," "environmental pleasantness," and "open space opportunity." An analysis of the effect of residents' perceptions of their neighborhoods on their park use found the following. In terms of personal characteristics, gender, age, occupation, and dwelling type exerted a significant effect on park use within a 5% significance level. In terms of health status and physical activity level, health issues, subjective stress, the number of days walked, and the length of spare time spent sitting exerted a significant effect on park use within a 5% significance level. In terms of the perception of the neighborhood environment factors, "open space accessibility" and "environmental pleasantness" exerted a significance influence on the respondents' park use within a 5% significance level.

As elaborated above, this study's contribution lies in having identified the differences in the way park users and non-users perceive their neighborhood environment, and in having teased out the perception factors which influence their park use. It is hoped that these findings will suggest a direction for neighborhood improvement measures based on design policies promoting healthy living and increased physical activity among urban residents. The limitations of the study include a limited geographical scope centering on the Suseong district of Daegu Metropolitan City, and the fact that the perception variables measured were limited to those which are subjective. Going forward, empirical case studies including more varied study areas will be necessary and a variety of objective space-based environmental that may potentially affect residents' park use should be considered.

ACKNOWLEDGMENTS

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