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The Restorative Effects of Urban Parks on Stress Control Ability and Community Attachment

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Abstract: Urban parks support community well-being and foster social connections through their restorative effects. This study examined the benefits of visiting parks, particularly perceived stress reduction and community attachment. Moreover, we analyzed the restoration effects as perceived by park users to gauge potential improvements in stress management and community bonding. Our findings revealed that spending time in urban parks offers significant benefits, notably enhancing stress management abilities and attachment to the community. In particular, park users' perception of restorative effects was associated with increased levels of community attachment. A lack of perceived restorative effects negatively impacted stress management capabilities. These findings have critical implications for the sustainability of urban park development and management, emphasizing their contribution to residents' mental health and community bonding. By recognizing and maximizing the restorative potential of urban parks, policymakers and park managers can create spaces that foster improved mental health, stronger social connections, and enhanced community well-being.

Keywords: urban parks; perceived restoration scale; perceived stress; community attachment

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1. Introduction

Urban parks have played a crucial role as social shelters during the COVID-19 pandemic, providing opportunities for rest, neighborly interactions, physical activity, and the cultivation of social resilience [1–4]. Some studies highlighted the restorative environment of urban parks and emphasized the application of restorative effects of urban parks into urban park planning and management to enhance the well-being of residents and communities [5,6]. The restorative effects of urban parks offer environmental and socioeconomic benefits [7], while also contributing to improved physical and psychological health [8–11]. Moreover, they align with the sustainability goals set forth by the United Nations in 2015 [12].

Some sociological research has addressed community attachment with a specific focus on urban parks. Xu et al. [13] explored the impact of physical environmental factors on community attachment among visitors to Discovery Green Park in Houston, TX, USA. In contrast, Zhu et al. [14] investigated the influence of individual characteristics, such as length of residence and socioeconomic status, on community attachment in a green open space in Beijing. Arnberger and Eder [15] investigated how urban green spaces and recreational behaviors affect community attachment in the Vienna region of Austria. These studies span international contexts, addressing a broad array of social backgrounds and cultural factors, including social structure and activities.

South Korea has recognized the restorative effect of urban parks and has made efforts to expand the overall park area. In 2020, the area of urban parks in South Korea increased by more than double, from 214 km^2 to 524 km^2 [16]. Moreover, a significant 76.6% of Koreans utilize parks more than once a month [17]. The Korean government aims to facilitate the

implementation of restorative urban park policies at both the individual and community levels. However, to achieve sustainability goals, research aimed at enhancing the health and resilience of local communities—specifically, comprehensive and diverse studies on the restorative effects of urban parks—is necessary [17].

Recent studies have extensively examined the outcomes of the interaction between public spaces, specifically parks, and individuals. These studies can be divided into two distinct categories: the promotion of visitors' health and the social impact of parks at the individual and community levels. Firstly, more greening in urban parks increases the human health value [6,18]. Independent variables such as park accessibility [19,20], visit duration [21], area size, and use frequency [22,23] contribute positively to individual health. Secondly, the interaction between residents and communities and the parks could generate social influence; frankly, there is a demand for empirical analysis of the social influence of parks on local communities [24]. In daily life, people have subjective experiences in urban parks or green spaces, such as taking time alone [19,25,26], meeting or observing others [3,4,27], engaging in physical activities [11,28–30], passing by the park or beholding the park throughout the windows [18,31–33]. Experiences with urban parks contribute to positive psychological outcomes at the community level, including enhanced social ties [34], increased social resilience [2], improved neighbor satisfaction [35,36], greater community participation [24], and stronger community attachment [15,37].

However, few recent studies measure the direct relationship between community attachment, one of the community's psychological factors, and the usage of urban parks. Community attachment is the intimate feeling and attitude toward the residing community [38]. The community has emerged as the fundamental resource for sustainable park management, which is going through the power of austerity finance [24,39]. Community is defined as a group of people who live in a specific region and are united by shared social–economic and cultural environments, civic responsibilities, and value standards [40,41]. The general understanding and research of community sociology lack consideration for the influence of shared spaces, such as urban parks, on the community using those spaces [42]. Starting with Relph [43], the perception of the invisible interaction between places and people has been mentioned. Still, the perception of the interaction between public open spaces and community attachment has not gained attention [42].

This study aimed to investigate the relationship between the restorative effects of urban parks, stress control ability, and community attachment by testing two hypotheses. First, we examined the difference between park users and nonusers in socioeconomic characteristics, stress control ability, and community attachment. Second, we investigated the differences in the socioeconomic characteristics, park proximity, duration of park visits, stress control ability, and community attachment between two groups of park users: those who perceived the restorative effects of parks and those who did not. By conducting these experiments, we sought to explore the potential link between community attachment, which is often overlooked in urban park planning and management. Additionally, we aimed to examine whether spending time with the perception of restorative environment in urban parks can have a positive impact on residents' mental health and community attachment. The findings of this study have significant implications for the planning and management of urban parks, providing insights that can contribute to the enhancement of residents' well-being and community engagement for the sustainability of urban development.

2. Literature Review

2.1. Restoration Environment of Urban Parks

Attention Restoration Theory posits that the presence of natural elements in urban parks plays a crucial role in mitigating fatigue and enhancing mental well-being. The theory refers to directed attention as a cause of stress and involuntary attention as a cause of stress reduction [44]. Directed attention works when performing tasks requiring concentration and effort, and psychological or physical fatigue is caused if it persists. However, involuntary attention does not require effort or concentration but somewhat reduces fatigue caused

by directed attention. The environment in which involuntary attention occurs is measured by the Perceived Restoration Scale (PRS) presented by Hartig et al. [45,46]. PRS is the most common and precise method of measuring the degree to which involuntary attention occurs [47]. PRS is a tool to measure the degree of fatigue recovery positively caused by stimulating environmental factors. The higher the PRS value is, the more favorable it is interpreted [48].

The Perceived Restoration Scale (PRS) is a survey model including four domains: being away, fascination, coherence, and compatibility [45,46,49]. Being away evaluates the experience of rest and mental fatigue recovery when being away from everyday life in a specific environment. Fascination assesses whether the unconscious stimuli perceived in the environment, such as visual and auditory cues, tactile sensations, can restore people's interest and concentration. Coherence evaluates the extent to which the natural environment's structural patterns, harmonious design, and principles are arranged in a cohesive manner, providing a sense of harmony and stability that contributes to the experience of restoration. Compatibility assesses the degree to which a specific environment aligns with individuals' preferences and desires, as well as their sense of connection and interaction with nature, while experiencing a sense of restoration. However, some researchers also include scope as an additional dimension to evaluate the restorative environment [48]. Scope focuses on the range and diversity of stimuli and behaviors that individuals perceive and engage in within the natural environment, assessing the impact of perceiving and exploring various elements of the natural environment on restoration [50,51].

The research on whether the restorative environment of urban parks, as assessed by PRS (Perceived Restoration Scale), can reduce fatigue has been continuously conducted, with the majority of studies confirming the effects through comparisons between natural and non-natural elements in urban settings [26,52,53]. Liu et al. [5] and Zhao et al. [54] evaluated the positive impact of different landscape elements in urban parks on individuals using PRS. They classified the landscape elements of urban parks and assessed their restorative effects. The results of their studies indicated that the characteristics of landscape elements had a positive impact on the perception of restorative effects. Berto [55] conducted a literature review and found that urban parks not only have a positive effect on visual fatigue recovery but also reduce negative moods and emotions. Kim et al. [56] and Kang et al. [57] conducted research comparing the restorative effects between green spaces and artificial spaces in urban areas. Their research findings indicate that green spaces within urban environments possess significant restorative effects.

Numerous studies have investigated the effects of various factors–including gender, age, frequency and duration of visit, education levels, and income–on perceived restoration scale (PRS) outcomes. Women are more likely than men to choose urban parks for rest and relaxation [58]. Additionally, women's park visits have been influenced by negative perceptual factors [59]. Elderly groups showed higher visitation frequency to urban parks compared to younger groups [60,61], and significant differences in Fascination were observed within specific age groups [58]. It has also been observed that the majority of visitors to urban parks are older age groups rather than younger ones [60,61]. Yakınlar and Akpınar's [62] findings proved that higher visitation frequency had a negative impact on being away, fascination, and compatibility, while having a positive impact on coherence. Longer duration in urban parks had a negative influence on fascination and coherence. This suggests that exposure to harmoniously designed park environments contributes to an increased sense of stability. Education level had a negative influence on coherence [62]. Scopelitti et al. [63] conducted a regression analysis on citizens of Bogota, dividing them into three groups based on income. The findings revealed that both the upper-income group and lower-income group exhibited a higher perception of the restorative effects of green spaces. Additionally, the lower-income group demonstrated a higher frequency of visits to green spaces. Nevertheless, research exploring the association between the restorative effects of urban parks and the social factors of park users is limited in the existing literature [58].

2.2. Perceived Stress Alleviation in Urban Parks

The Perceived Stress Scale (PSS) is often used to demonstrate the stress-relieving effects of park environments [64]. The Perceived Stress Scale (PSS) is a questionnaire developed by Cohen and Williamson [65] to subjectively measure an individual's perception of stress in their life situation [66]. It consists of a total of 10 items, divided into positive stress items and negative stress items [67]. Fan et al. [22] utilized survey results from 1544 urban park users to confirm that urban parks promote social support to reduce personal stress. Chiang and Li [19] used survey data from 964 individuals to establish the association between access to urban parks and stress reduction. Wang et al. [18] examined 140 urban park users and found significant improvements in stress reduction. Studies that employed both PSS and PRS concurrently observed that urban parks positively contribute to stress recovery among 125 participants [68]. Ojobo et al. [64] investigated 22 participants and identified a correlation between perceived stress, the fascination dimension of PRS, and participant age.

2.3. Public Green Spaces and Community Attachment

Community attachment is considered to improve community capacity in community actions and community health. Theodori [69] found that higher community attachment seems to have a higher possibility of community action than lower community attachment. High community attachment might increase the possibility that the community perceives common problems and works together to solve them. O'Brien et al. [70] found that lower community attachment influenced the depression of residents in rural communities.

Brehm et al. [37] tested the relationship between local environmental concern and community attachment with two dimensions: social attachment and natural environment attachment. Their findings proved that higher social attachment led to higher satisfaction with the quality of the natural environment and enhanced local environmental concern. In other words, high community attachment is likely to be a catalyst for participating in environmental protection activities or eco-friendly development activities.

Public green spaces might increase community attachment. Arnberger and Eder [15] estimated the impact of the perceived green space environment and recreation behavior on community attachment. According to their findings, the high quality of nearby public green spaces increased community attachment. Private gardens at home or second homes did not influence community attachment, suggesting only public green spaces as facilitators of community attachment. In summary, urban parks in which community residents have subjective experiences might increase community attachment. However, the empirical study on the relationship between urban parks and community attachment should be utilized to formulate policies and improve management strategies for the sustainability of urban park development.

3. Method

3.1. Site Information

This study was conducted in Asan City, located in the northwesternmost part of Chungcheongnam-do, Republic of Korea, with a population of 357,517. The total area of Asan City is approximately 542 square kilometers. Asan City is home to 174 parks, covering a total park area of 3.5 square kilometers, which accounts for 0.64% of the city's total area [16]. The park area in Asan has experienced a remarkable growth of 218% since 2008 (Figure 1) Moreover, Asan City is currently undertaking a total of 52 residential and urban development projects, which will further expand the park area to 2.95 square kilometers. Asan has emerged as a city of significant economic and industrial value, with its parks witnessing a rapid expansion. These factors make Asan an excellent research target, highlighting the city's evolving landscape and its relevance for study.

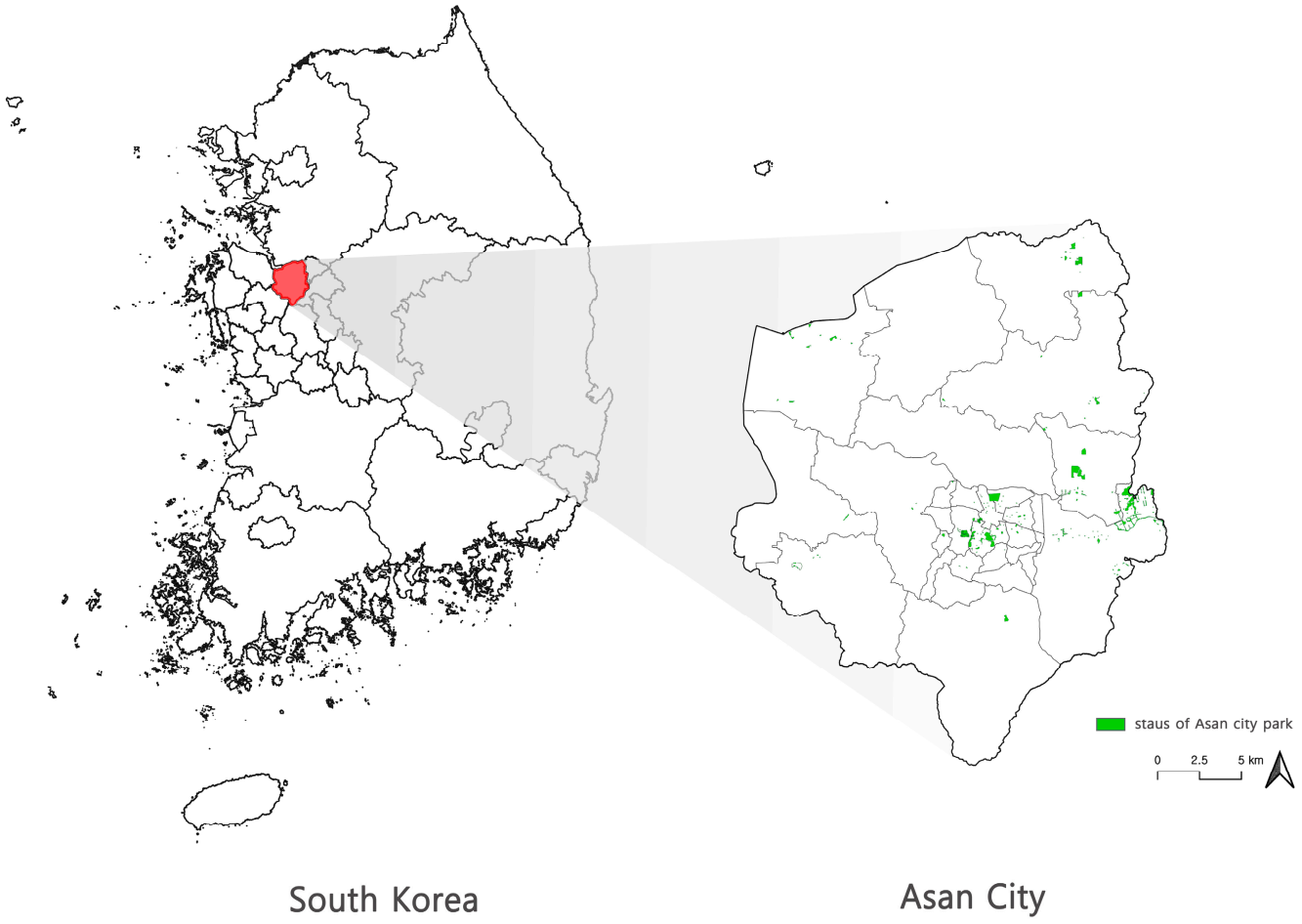

Figure 1. Location and park area of Asan City.

3.2. Sampling

In our study, we participated in the 2030 Asan City Park, Green Space, and Service Basic Plan project, collecting valuable data. To ensure ethical considerations were included, the survey was approved by Kongju University Institutional Bioethics Committee (KNU_IRB_2022-027). From 4 April to 2 May 2022, we conducted the survey at multiple locations, including Asan City Hall, local sports centers, and 17 administrative centers. The survey targeted citizens residing in Asan, and we distributed a total of 1101 questionnaires.

Out of the distributed questionnaires, we successfully collected 641 responses. After careful evaluation, we utilized 486 questionnaires as our primary dataset, excluding 155 questionnaires due to missing values and outliners. Prior to participating in the survey, respondents agreed to the use of their survey results. As a token of appreciation, we offered a gift valued at USD 2.2 to each participant.

3.3. Measurement

The survey included 30 questions about perceived stress, perceived restoration of parks, community attachment, park proximity, hours using parks in a week, and socioeconomic information (gender, age, educational level, length of residence, and annual household income). Participants were initially asked if they frequented any parks. In the case of park usage, supplementary questions were posed regarding the proximity to the park and the duration of park visits within a week. The proximity to the park used by participants was assessed using a three-choice check: respondents indicated whether the park they used was located within 1 min, 10 min, or 20 min from their home. Participants also provided an approximate number of hours they spent using parks within a week.

Ten field experts pretested the questionnaire and then used the complementary results. Ten items of Perceived Stress Scales (PSS) developed by Cohen et al. [71] were used to assess perceived stress on a 5-point scale (1 = not at all, 5 = thoroughly). The measurement of perceived restoration was based on Berto's [72] a binary scale (1 = no, 2 = yes) including the following five questions: (1) that is a place which is away from everyday demands and where I would be able to relax and think about what interests me (being-away); (2) that place is fascinating; it is large enough for me to discover and be curious about things (fascination); (3) that is a place where the activities and the items are ordered and organized (coherence); (4) that is a place which is very large, with no restrictions to movements; it is a world of its own (scope); (5) in that place, it is easy to orient and move around so that I could do what I like (compatibility).

Community attachment was measured through seven statements derived from Jurowski et al. [73] and Gursoy et al. [38] with a 5-point scale (1 = not at all, 5 = thoroughly), as follows: (1) I feel at home in this community; (2) I know what goes on in this community; (3) What happens in my community is important to me; (4) I have an emotional attachment to this community–it has meaning to me; (5) I am willing to invest my talent or time to make this an even better place; (6) I am willing to make financial sacrifices for the sake of this place; (7) If I were to leave this community, I would be sorry.

3.4. Analysis

All statistical analyses were conducted using the SPSS v.27.0 program. First, exploratory factor analysis with a varimax rotation was conducted on PRS, perceived stress, and community attachment. PRS and community attachment were reduced by one factor, with Cronbach's alphas of 0.732 and 0.861, respectively. Perceived stress was reduced by two factors, each with Cronbach's alpha values of 0.766 and 0.881. One factor was named positive perceived stress (PPS), and the other was negative perceived stress (NPS). Cronbach's alpha values for reliability were checked [74]. Secondly, a *t*-test was employed to examine the differences in socioeconomic characteristics, PPS, NPS, and community attachment between the park user and non-user groups. Thirdly, the perception of the restorative effects of urban parks was assessed to determine differences in park proximity, time spent in parks, PPS, NPS, and community attachment. Participants who responded affirmatively to feeling a sense of being away, fascination, coherence, scope, and compatibility in their used park were categorized as the perception group, while those who responded negatively were assigned to the non-perception group. The *t*-test was then conducted using these groups as a dependent variable.

4. Result

4.1. Demographic Characteristics

Of the 486 respondents, 63.8 percent used the park, and 36 percent did not, as shown in Table 1. In terms of gender, the park user group was 59 percent male and 34 percent female. The non-users were 52 percent male and 38 percent female. In terms of age, 40 percent of the park user group were in their 60 s, and 25 percent were in their 50 s. Thirty percent of the nonusers were in their 60 s, and 25 percent were in their 50 s. A majority of park users and nonusers had at least a bachelor's degree. Regarding annual household income, 34 percent of park users had at least USD 41,668, and 40 percent of nonusers had between USD 25,001 USD and USD 41,667. Regarding the length of residence, 58 percent of park users and 63 percent of nonusers lived under 10 years in Asan. In terms of park proximity, 35 percent of park users used accessed parks within 10 min from their home. Furthermore, 68 percent of park users spent up to one hour at parks weekly.

Table 1. Descriptive statistics of the participants.

Characteristic	Park User (N = 311)		Park Non-User (N = 175)	
	Frequency	Percentage (%)	Frequency	Percentage (%)
Gender				
Male	108	35	68	38
Female	186	60	92	52
Age				
~30s	49	16	37	21
40s	59	19	42	24
50s	77	25	44	25
over 60s	126	40	52	30
Educational level				
~high school	126	39	64	37
college or above	183	58	110	63
Annual household income				
under USD 25,000	101	32	62	35
USD 25,001–41,667	101	32	69	40
above USD 41,668	106	34	44	25
Length of residence				
~10 years	179	58	110	63
30 years	104	34	54	31
above 31 years	26	8	9	5
Using parks proximity				
within 1 min	97	31		
within 10 min	109	35		
within 20 min	86	28		
Hours using parks in a week				
~1 h	212	68		
2 h	39	13		
over 3 h	38	12		

Note.: KRW 1200 = USD 1.

4.2. Differences in Park Users and Nonusers in Stress Control Ability and Community Attachment

Table 2 presents the results of the t-test conducted to examine the differences between park users and non-users across various variables. First, park users exhibited a significantly higher mean age compared to non-users ($t = -2.898$, $df = 484$, $p < 0.05$). This suggests that older individuals are more likely to utilize the park facilities. Second, the mean PPS score of park users was found to be significantly higher than that of non-users ($t = -2.880$, $df = 484$, $p < 0.05$). These results imply that park users possess better stress control abilities in mentally challenging environments compared to non-users. Third, park users demonstrated a significantly higher level of community attachment compared to non-users ($t = -7.147$, $df = 484$, $p < 0.05$). This indicates that when residents utilize parks, they tend to feel more affectionate toward their community, experience a sense of belonging, and are more willing to invest their time and talents to improve the community. However, gender ($t = 1.194$, $df = 484$, $p > 0.05$), length of residence ($t = -1.640$, $df = 484$, $p > 0.05$), education level ($t = 0.987$, $df = 484$, $p > 0.05$), annual household income ($t = -1.476$, $df = 484$, $p > 0.05$), and NPS ($t = 0.510$, $df = 484$, $p > 0.05$) did not exhibit any significant differences between park users and non-users.

Table 2. Differences between park users and non-users.

	Park Users	Park Non-Users	*t*
	Mean (SD)	Mean (SD)	
Gender	0.37 (0.48)	0.43 (0.50)	1.194
Length of residence	1.54 (0.75)	1.43 (0.65)	−1.640
Age	3.07 (1.31)	2.71 (1.24)	−2.898 *
Educational level	2.54 (0.59)	2.60 (0.56)	0.987
Annual household income	2.19 (1.07)	2.04 (1.02)	−1.476
Positive perceived stress	0.10 (1.01)	−0.17 (0.95)	−2.880 *
Negative perceived stress	−0.02 (1.02)	0.03 (0.97)	0.510
Community attachment	0.23 (0.97)	−0.41 (0.91)	−7.147 **

Note: * $p < 0.05$, ** $p < 0.001$.

4.3. Perceptions of Restoration Affecting Stress Control Ability and Community Attachment

According to the results presented in Table 3, the perception group of being away in the park had a lower education level compared to the non-perception group ($t = 2.174$, $df = 307$, $p < 0.05$). The perception group of being away spent more time in the parks than the non-perception group ($t = -6.437$, $df = 307$, $p < 0.05$). The community attachment of the perception group of being away was higher compared to the non-perception group ($t = -3.229$, $df = 307$, $p < 0.05$).

Table 3. Differences in PRS between perception groups and non-perception groups among park users.

	Being Away			Fascination			Coherence		
	PG	NPG	*t*	PG	NPG	*t*	PG	NPG	*t*
	Mean (SD)	Mean (SD)		Mean (SD)	Mean (SD)		Mean (SD)	Mean (SD)	
Gender	0.37 (0.48)	0.33 (0.48)	−0.451	0.39 (0.49)	0.30 (0.46)	−1.274	0.37 (0.48)	0.37 (0.49)	0.000
Length of residence	1.56 (0.76)	1.38 (0.64)	−1.405	1.58 (0.76)	1.40 (0.69)	−1.794	1.60 (0.78)	1.35 (0.61)	−2.862 *
Age	3.09 (1.32)	2.92 (1.28)	−0.733	3.10 (1.30)	2.97 (1.36)	−0.694	3.14 (1.30)	2.88 (1.35)	−1.473
Educational level	2.52 (0.59)	2.74 (0.55)	2.174 *	2.50 (0.59)	2.68 (0.58)	2.216 *	2.48 (0.61)	2.74 (0.47)	3.880 **
Annual household income	2.18 (1.07)	2.21 (1.09)	0.156	2.20 (1.08)	2.14 (1.06)	−0.353	2.20 (1.07)	2.12 (1.07)	−0.556
Park proximity	1.99 (0.79)	1.76 (0.80)	−1.695	1.99 (0.80)	1.88 (0.77)	−0.998	1.99 (0.79)	1.89 (0.80)	−0.914
Hours using parks in a week	1.51 (0.90)	1.06 (0.23)	−6.437 **	1.51 (0.90)	1.24 (0.64)	−2.738 *	1.50 (0.90)	1.30 (0.70)	−1.972
Positive perceived stress	0.12 (1.00)	−0.07 (1.09)	−1.067	0.12 (1.02)	0.02 (0.99)	−0.743	0.10 (1.02)	0.13 (0.96)	0.160
Negative perceived stress	−0.02 (1.02)	0.03 (1.02)	0.320	−0.02 (0.99)	−0.01 (1.10)	0.108	−0.09 (0.98)	0.20 (1.12)	2.092 *
Community attachment	0.30 (0.95)	−0.24 (1.01)	−3.229 *	0.33 (0.94)	−0.10 (1.04)	−3.329 *	0.34 (0.95)	−0.08 (0.99)	−3.222 *

Note: * $p < 0.05$, ** $p < 0.001$. PG is perception group; NPG is non-perception group.

Similarly, the perception group of fascination in the park had a lower education level compared to the non-perception group ($t = 2.216$, $df = 307$, $p < 0.05$). The perception group of fascination used parks longer than the non-perception group ($t = -2.738$, $df = 307$, $p < 0.05$). The community attachment of the perception group of fascination was higher than that of the non-perception group ($t = -3.329$, $df = 307$, $p < 0.05$).

In terms of the perception group of coherence in the park, they had a longer length of residence in Asan compared to the non-perception group ($t = -2.862$, $df = 307$, $p < 0.05$). The perception group of coherence was lower in the education level than the non-perception group ($t = 3.880$, $df = 307$, $p < 0.05$). The NNS of the non-perception group was higher than

that of the perception group ($t = 2.092$, $df = 307$, $p < 0.05$). It appears that when residents cannot perceive the coherence of their park, their stress control ability does not seem to be enhanced by park usage. The community attachment of the perception group of coherence was higher than that of the non-perception group ($t = -3.222$, $df = 307$, $p < 0.05$).

Table 4 reveals that the proximity of the park was higher in the scope perception group compared to the non-perception group ($t = -2.239$, $df = 307$, $p < 0.05$). The non-perception group of scope was higher in the NPS than the perception group ($t = 3.745$, $df = 307$, $p < 0.05$). This findings suggested that when residents could not feel sufficient opportunity for movement within the park, they may exhibit a weaker ability to cope with negative stress.

Table 4. Differences in PRS between perception groups and non-perception groups among park users.

	Scope			Compatibility		
	PG	NPG	*t*	PG	NPG	*t*
	Mean (SD)	Mean (SD)		Mean (SD)	Mean (SD)	
Gender	0.38 (0.49)	0.30 (0.46)	−1.111	0.38 (0.49)	0.31 (0.47)	−0.695
Length of residence	1.54 (0.75)	1.53 (0.73)	−0.069	1.54 (0.76)	1.53 (0.70)	−0.110
Age	3.09 (1.32)	2.91 (1.28)	−0.863	3.12 (1.31)	2.64 (1.36)	−2.088 *
Educational level	2.52 (0.59)	2.65 (0.57)	1.357	2.53 (0.59)	2.67 (0.53)	1.407
Annual household income	2.16 (1.07)	2.30 (1.09)	0.818	2.17 (1.07)	2.36 (1.10)	1.022
Park proximity	2.00 (0.81)	1.71 (0.60)	−2.239 *	1.96 (0.80)	1.94 (0.77)	−0.172
Hours using parks in a week	1.46 (0.86)	1.43 (0.84)	−0.224	1.50 (0.89)	1.13 (0.49)	−3.616 *
Positive perceived stress	0.08 (1.01)	0.19 (1.00)	0.678	0.12 (0.98)	0.01 (1.09)	−0.649
Negative perceived stress	−0.11 (0.99)	0.49 (1.03)	3.745 **	−0.07 (1.00)	0.40 (0.96)	2.641 *
Community attachment	0.23 (0.95)	0.22 (1.11)	−0.067	0.26 (0.95)	−0.04 (1.13)	−1.757

Note: * $p < 0.05$, ** $p < 0.001$. PG is perception group; NPG is non-perception group.

The perception group that perceived compatibility in the used parks tended to be older than the non-perception group ($t = -2.088$, $df = 307$, $p < 0.05$). The perception group of compatibility stayed in the park for the longer duration compared to the non-perception group ($t = -3.616$, $df = 307$, $p < 0.05$). The non-perception group of compatibility had a lower NPS than the perception group ($t = 2.641$, $df = 307$, $p < 0.05$). These findings suggest that when residents are unable to perceive compatibility within their park, they appear to have a lower ability to cope with negative, stressful environments.

5. Discussion

5.1. Benefits of Using Parks

In terms of age, the park use group is likely older than the non-use group. This finding is similar to Kemperman and Timmermans's [61] finding that elderly residents seemed to visit the parks more than younger residents. The elderly are more likely to visit parks more frequently due to their greater leisure time and heightened interest in health promotion compared to younger individuals. Park users seemed to have a higher stress control ability than non-users. This finding is consistent with the findings of Chiang and Li [19], Feda et al. [28], Hansmann et al. [25], Hazer et al. [30], and Thompson et al. [11]. Visiting parks might increase positive perception to control over stressful environments. This finding might prove that the community has gained benefits concerning mental health.

The park users had a higher community attachment than the non-users. This finding indicates that community residents who visit and stay in parks are more likely to have a positive feeling toward their community, are interested in the affairs of the community, and are willing to invest some money and time to develop their community. This finding is in line with Arnberger and Eder's [15] finding. A regular user of the community's recreation areas might feel higher affection for the community.

5.2. Differences between Restorative Effects Perception Groups and Non-Perception Groups among Park Users

The coherence perception group demonstrated a significantly longer residence period, indicating that they spent more time in the park. This extended duration suggests that the group had a sustained and prolonged engagement with the park over an extended period of time.

The compatibility perception group exhibited a significantly higher average age compared to the non-perception group. This finding suggests that the comfortable utilization of space could be regarded as a crucial factor for elderly residents. Furthermore, previous research has consistently shown that PRS score for the same natural elements is higher among the elderly population when compared to adolescents and young adults [60,61]. These findings imply that the influence of age varies depending on the specific planning region, highlighting age as a particularly influential factor in relation to the park's restorative effects. However, age was not the significant factor in Yakınlar and Akpınar's [62] findings.

The scope perception group had a significantly larger distance between their residences and the park they predominantly used compared to the non-perception group. This finding suggests that, despite the park being situated far from their home, individuals in this group were more likely to visit it. This could be attributed to their perception of the park as a spacious area with abundant room for various activities. The perceived scope of the park, therefore, plays a significant role in motivating individuals to overcome the distance barrier and utilize the park for unrestricted activities.

The group that perceived a sense of being away, fascination, and compatibility spent a significantly longer amount of time in the park on a weekly basis. This suggests that when the park's spatial composition enables residents to experience a sense of being away, fascination, and compatibility, it is expected that they will spend more time utilizing the park. The findings of the study by Yakınlar and Akpınar [62] indicated that shorter duration of park visits was associated with higher perceived restorative effects. This may be attributed to the analysis of various types of parks based on factors such as area size, vegetation ratio, water features, and presence of buildings, which significantly influenced respondents' perceptions.

The group that perceived coherence, scope, and compatibility experienced a lower perception of negative stress. The group that perceived coherence, scope, and compatibility experienced a lower perception of negative stress. Findings from *t*-test reveals a significant difference in the degree of perceived negative stress, with higher levels observed in the scope non-perception group. This finding confirms the importance of scope in the composition of environmental elements within urban parks. Furthermore, when coherence and compatibility were recognized, the degree of negative stress was significantly lower. This result equally emphasizes the importance of coherence and compatibility in mitigating negative stress perception.

To reduce the degree of perceived negative stress, it is crucial to design each space within urban parks as well-organized areas for activities. This includes securing appropriate usage spaces and providing easy movement within the park, as well as creating desired activity spaces that meet the needs of park users. By implementing these design principles, the perception of negative stress can be effectively reduced.

This study contributes to the existing body of research by highlighting the significance of coherence, scope, and compatibility in urban park planning. Unlike previous studies that primarily emphasized the restorative effects of urban parks, this research confirms their specific importance in relation to mitigating negative stress. The findings suggest that incorporating these elements into park design is essential for creating supportive and stress-reducing environments for park visitors.

Urban parks that provide users with a sense of being away, fascination, and coherence in design are likely to foster community attachment. Community people who utilize urban parks for relaxation and contemplation of interesting things may exhibit a more affectionate attitude and willingness to contribute to the betterment of their community.

Respondents who answered that the park they use is attractive and fully available to do curious things demonstrate higher community attachment compared to those who do not share such perceptions. Respondents who perceived that the park they use is ordered and organized well have higher community attachment than those who did not perceive it. These findings align with the results of Arnberger and Eder [15], who analyzed the relationship between the degree of recognition of the quality of green space and community attachment. They measured how much community residents perceived the quality, importance, and necessity of green space in the community and how often they visited the recreation area as the independent variables influencing community attachment. They found that the better the quality of green spaces, the more green spaces are hoped to be created in the community and the higher the local community attachment is to visit the recreation areas. The quality of spaces, the eagerness to plan green spaces in the community, and the frequent visitation to recreation areas increased community attachment. When people in the community visit and use a good quality park, positive feelings and the intention to invest time and money for a better community could be generated. In addition, spending time in privately owned green spaces was insignificant in increasing community attachment. Thus, restorative effects of urban parks might play a role as an opportunity to foster and strengthen community attachment.

6. Conclusions

In this study, we experimented with two hypotheses to analyze the relationship between the restorative effects of urban parks, stress control ability, and community attachment. Firstly, we compared park users and non-users in terms of their socioeconomic characteristics, stress control ability, and community attachment. The findings indicated that people who used the park were older and had higher positive stress control ability and community attachment compared to non-users. Secondly, we examined the differences between the restorative effects perception groups and non-perception groups among park users on various factors such as socioeconomic characteristics, park proximity, park usage duration, perceived stress, and community attachment. The perception of being away and fascination with parks is likely related to education level, the hours of park use, and community attachment. The perception of the coherence of parks might be related to the length of residence, education level, negative stress control ability, and community attachment. The perception of parks' compatibility is likely related to age, park use hours, and negative perceived stress. The scope of parks is likely related to the proximity to parks and negative perceived stress.

These findings provide important implications that can enhance the sustainability of urban park planning, management, and development. Firstly, community attachment can be enhanced when the urban park is planned to recognize being away, fascination, and coherence. An increase in community attachment can lead to the sustainability of park development and management. For example, if residents who use the park have a strong attachment to their local community, they could potentially play a role in sustaining park management by contributing donations or actively participating in the development and implementation of park management programs, even in the face of decreased government funding for park management. Secondly, it is confirmed that the difference between the age and education level of residents is a matter to be reviewed for the planning of urban parks. If residents who use the park have a higher level of education, the restorative effects of the park may be diminished. Therefore, if the local community has a higher level of education, the design and management of the park should be carried out more meticulously. To increase the park usage rate among young residents, it would be necessary to develop management strategies that cater to the preferences and demands of the youth in that community.

Thirdly, recognizing the aspects of being away, fascination, and compatibility can help increase the usage time of urban parks. Fourthly, the utilization of urban parks can effectively reduce negative stress levels. The traditional top-down decision-making

approach in park planning, which often neglects the needs of local communities, may not effectively alleviate the stress experienced by park users. To ensure sustainability of the urban park development and management, a comprehensive perspective on the socio-economic status of the community, community attachment, and the mental health of the community is necessary.

However, it is important to note that this study had a limited sample size and focused on a specific region. Therefore, it is recommended to conduct expanded research encompassing various target regions in the future. This would enable a broader understanding of the relationship between urban parks and community-related factors, such as community attachment. By examining the structural dynamics between these variables, valuable insights can be obtained, which can facilitate innovative changes in the planning and management of urban parks.

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