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Differences in Perceptions of Naturalness among Urban Park User Groups in Seoul

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Abstract: Though the activities in urban facilities have declined during the COVID-19, the demand for visiting open spaces and parks has increased. Visitors to city parks also increased in Seoul. People have realized that nature is an important space for safety, health, and leisure in their everyday life. This study implied that people intended to visit city parks as a natural space in the urban area. So, an assessment criterion of the quality of environments of city parks, naturalness is selected as one of the indicators. This study chose six parks as a study subject in Seoul and found differences for users in the perception of naturalness in city parks. Q methodology is a useful tool to identify differences between individual's perceptions of nature. Through the Q analysis, six groups have differences in the perception and the valuation of naturalness. The study found that differences have resulted from their past experiences, personal preferences, and psychological status. The first group can be named a dynamic type who enjoys various landscapes, and the second is the group of people who love to meditate in serene woodlands. The third group wants to observe the animals and consider the ecosystem as important, and the fourth group is those who love to feel the changing seasons with sensitivity. The fifth group recognizes nature through the contrast between the building and the natural environment in the city. The last group is those who pursue conservation for old trees or the existing nature environment itself. As a general, appraisal of perceived naturalness is subjective and individual. The perception of naturalness influences landscape preferences and attitudes to city parks. Therefore, the naturalness perceived by users should be a crucial consideration to maximize park services so that users can appreciate various tastes.

1. INTRODUCTION

It is essential for planners and policy makers to explore the experiences of urban green users in order to create a city in which green spaces are designed by considering not only ecological priorities but also user perceptions (Buchel and Frantzeskaki, 2015). Human experience of nature is achieved through the senses. In landscape aesthetics, "perception" means not only interpreting stimuli in the process of information processing, but



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also users may actively receive stimuli from all around them ([Kaplan, R. and Kaplan, 1989](#); [Kou, Tao et al., 2020](#); [Nohl, 2001](#)). The European Landscape Convention defines 'landscape' as a space as perceived by people, whose character is the result of the action and interaction of natural or human factors ([Van Heijgen, 2013](#)). The "preference" for natural landscapes is a sort of aesthetic perception response to environmental stimuli, and the user perceives many elements in landscape. So, the way users accept the landscape affects their preference for the landscape. Therefore, landscape assessment can provide a specific standard for what policy makers and designers are looking for in designing urban green space and environment.

After COVID-19 ([Geng, Innes et al., 2021](#); [Rice and Pan, 2021](#)), the movement towards other urban settlements has declined, but the demand for open spaces such as parks worldwide has exploded. In addition, visitors to the city's parks are more numerous throughout the year in Seoul. The reason is that people have realized that nature is important for the safety and health of leisure in their lives. The attraction of urban parks is that of a place that respects nature. Therefore, the study implied that people intended to visit the urban park as a natural area in the city, so an assessment criterion of the degree of the nature in the park, "naturalness" was selected as an indicator. "Perceived naturalness by users" was studied in terms of cultural ecosystem services. We selected six parks in Seoul and found that there is a difference for users in the perception of naturalness.

In this study, Q-statements were collected by interviews with users of target sites, and 'perception factors of naturalness' in city parks were organized based on the natural factors mentioned in the statements. Q methodology can reveal perspectives as participants can organize the categories of analysis according to their own preference ([Buchel and Frantzeskaki, 2015](#)). Measuring subjectivity in a structured way that provides personal, qualitative data ([Brown, R. S., Moon et al., 1980](#)), Therefore, Q methodology identifies differences in interpretation between individuals in terms of nature and reveals differences in user perceptions. The characteristics of the natural space felt by the user in the city park were summarized in 17 sentences, and Q-sorting was conducted according to the more natural and important ones.

Seoul's urban park users were categorized into six nature perception groups based on their past experiences, personal preferences and psychological status. The first group is a dynamic type who enjoys various landscapes, and the second group is people who meditate in the calm forest. The third group is the one who observes the animals and points out the importance of the ecosystem, and the fourth group is the one who feels the changing seasons with sensitivity. Fifth is the type that recognizes nature through the contrast between the building and nature in the city, and the last group is the type that pursues the essence of the old tree or the original nature.

The perception of Naturalness of individuals is linked to their preference for space, and the statement to each group are deeply related to the cultural services they expect from the park. The city park can be designed based on user perception, and a variety of design perspectives can be described.

Landscape recognition and evaluation of the landscape aesthetic value are one of key elements of human-recognized ecosystem service evaluation. Natural landscapes, which are well managed urban environments, play a positive role in people's mental health. Also it serves as a ground for forming various physical activities and social relationships ([Kaplan, R. and Kaplan, 1989](#)). In landscape aesthetics, the cognitive level of landscape

attributes is not only closely linked to psychological factors and landscape preferences ([Kaymaz, 2012](#)) also useful tools for predicting users' spatial preferences ([Kaplan, R. and Kaplan, 1989](#); [Ode, Tveit et al., 2008](#)). closely linked to psychological factors and landscape preferences ([Kaymaz, 2012](#); [Thompson, 2018](#)) also useful tools for predicting users' spatial preferences ([Kaplan, R. and Kaplan, 1989](#); [Ode, Tveit et al., 2008](#)).

The concept of naturalness is one of the classical concepts that is studied in landscape-preference research. Naturalness can be commonly defined as "The similarity state of a current ecosystem that includes recognition of people whose that scape in its natural state" ([Winter, 2012](#)). In a review by Tveit et al. (2006), the concept of naturalness is described as relating to how close a landscape is to a perceived natural state. The importance of naturalness has been put forward by several environmental-psychology theories. The concept of naturalness has theoretical support in the Biophilia hypothesis ([Appleton, 1975](#); [Kaplan, S., Kaplan et al., 1972](#); [Kellert, 1997](#); [Lamb and Purcell, 1990](#); [Purcell, A. and Lamb, 1984](#)), theories about restorative landscapes ([Kaplan, R. and Kaplan, 1989](#); [Lamb and Purcell, 1990](#); [Lyytimäki, Petersen et al., 2008](#)) and empirical studies supporting its importance in shaping landscape preference ([Purcell, A. T. and Lamb, 1998](#)).

According to the "Biophilia hypothesis" theory, the visual contact between nature and humans can be evaluated as "perceived naturalness." A common feature for these is their emphasis on the functional significance of nature from an evolutionary perspective, thereby suggesting that a natural landscape provides a landscape with restorative properties and is a higher-quality habitat for humans.

The level of naturalness is a factor that has positive effects on both human well-being ([Sang, Knez et al., 2016](#); [Stigsdotter, Palsdottir et al., 2011](#)) and biodiversity ([Sandström, Angelstam et al., 2006](#)). Also, highly perceived naturalness leads to more activities and attributed aesthetic values ([Sang, Knez et al., 2016](#)). Therefore, evaluating "perceived naturalness" means understanding the degree of intimacy and preference felt by the subject who perceives this natural state ([Tveit, M. S., 2009](#)), and as an indicator of landscape evaluation, what humans feel, and the behaviors they perform in a specific natural space ([Tveit, M., Ode et al., 2006](#)). [Council of Europe \(2000\)](#) defines 'landscape' as an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors. The landscape perceived by humans does not have meaning in itself but is a result of interpretation between humans and nature ([Van Heijgen, 2013](#)). Thus, the perception and preference of landscape can be understood by humans from two perspectives: evolutionary and cultural ([Appleton, 1975](#); [Tveit, M., Ode et al., 2006](#)). From an evolutionary point of view, the focus is on the human's sensory perception biologically. From a cultural point of view, landscape is understood through empirical environmental factors, personal subjective view of landscape features, and phenomenological understanding.

Perception is a complex word that encompasses psychological and physiological processes. This means a series of processes, including simple information "cognition," and lyrical emotions or affective atmospheres that humans feel from landscapes. It also includes value judgments of preferences and non-preferences. Landscape perception process is divided into object perspective and subject perspective ([Nohl, 2001](#)). Looking at previous studies on environmental perception, landscape quality was evaluated by the concept of 'emotion adjective' or 'complexity, consistency,

clarity, mystery, diversity, intimacy, naturalness in space' ([Machado, 2004](#); [Zube, Sell et al., 1982](#)).

Therefore, this paper has also divided the statement by referring to the environmental perceptual evaluation factors of landscape. The researcher's understanding of the subjectivity of landscape begins with the difference of the subject who enjoys landscape, so this paper aims to find out the difference of the users of urban parks who recognize landscape. This finding is the basis of the space use type of urban park space users found in the difference of their perception.

So, what varieties of the users' perceived naturalness do we have in the cases of urban parks in Seoul? And what are the commonalities and differences in each perceived naturalness?

2. RESEARCH METHODOLOGY

2.1 STUDY AREA

As shown in *Figure 1*, this study is conducted on 6 representative parks of Seoul city. Land classification was evaluated for 2,868 urban parks presented in Seoul Public Data in 2020, as a result, six sites were selected. The target areas were Seon-jeongneung royal tombs, West Seoul Lake Park, Seokchon Lake Park, Boramae Park, Seoul Forest, and Seoul Olympic Park.

In the case of Seon-jeongneung royal tombs, it is a park located in the center of “Gangnam” and rich in broad-leaved forests and coniferous forests. As a national cultural asset, it has different characteristics from the other five parks, but it serves as a neighbourhood park for nearby companies.

West Seoul Lake Park was created adjacent to the nearby mountain in the case of West Seoul Lake Park. The wasted water purification plant was remodelled as a park. It is designed at a slope along the mountain, so you can feel the gradient as a whole.

Seokchon Lake Park was originally formed due to the Han River landfill project in 1971 at the ‘Song-pa Port’ site in the Han River. In 2001. It is equipped with the present lake. It is 2.5km in circumference, a very large lake park, and represents Songpa-gu. It is divided into two parts based on Song-pa Street. Lotte World Magic Island is located on the west side, and the east side is often used as a promenade for nearby residents.

Boramae Park has a lot of natural forest and lake inside. However, there is a playground in the center of the park. November 2020, the interior of the park is very crowded due to the construction of the Shin-lim Line (Metro Station). Compared to other park facilities, there are many public facilities such as Youth Training Center, and Residents' Hall in the park.

Seoul Forest is currently constructing a park, and accordingly, it will be increased in forestland and grassland space. There are many water purification facilities and insect learning centers in the park. Also there are many young trees in the area, and places that users can observe deer in natural ecological forests.

Seoul Olympic Park is a park that has been continuously managed since 1986 to host the 1988 Seoul Olympics, so the trees that have grown for 34 years are dense. In addition, it is a representative park of Seoul with a very wide area of the park and excellent open grassland scenery such as Mongchon Saturn and alone tree.

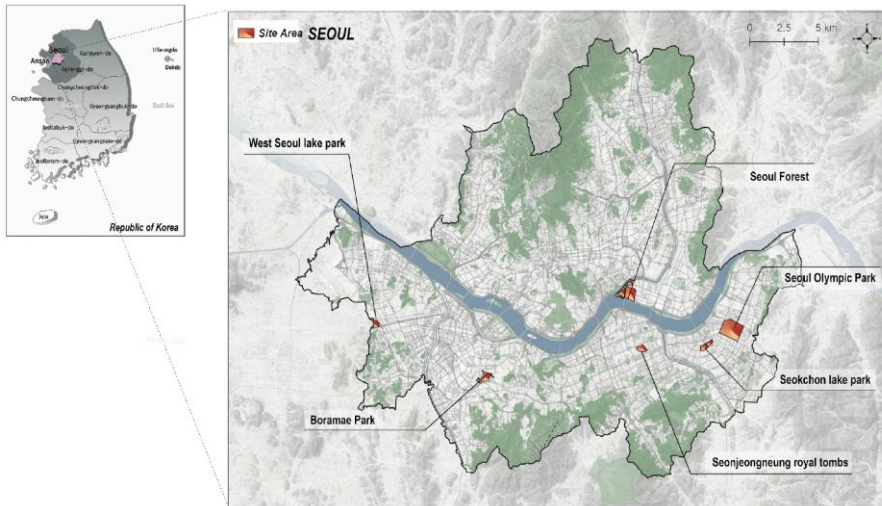


Figure 1. Study site

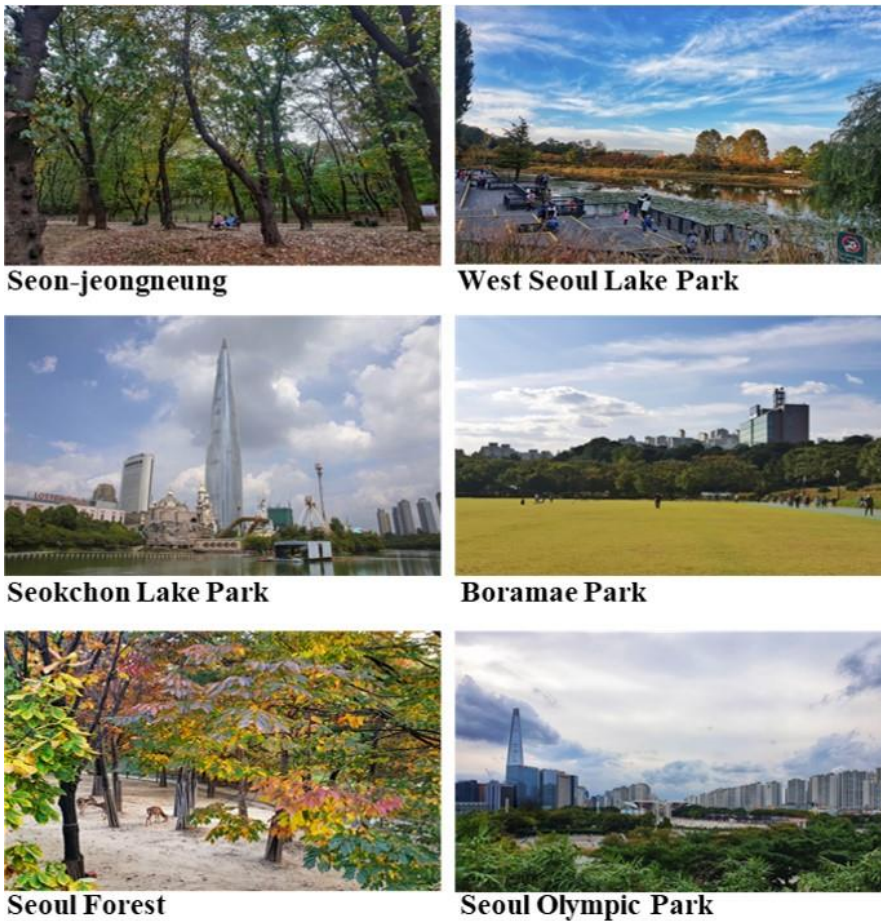


Figure 2. Target area

2.2 Q method

Users' perception is an indicator of culture ecosystem services. In the previous studies that examined user awareness of urban green spaces ([Buchel and Frantzeskaki, 2015](#); [Fagerholm, 2012](#); [Plieninger, Dijks et al., 2013](#)), “perception” presupposes the connection of “attitude” or

“action” (Buchel and Frantzeskaki, 2015). In order to create a green space it is essential for designers and policy makers to explore the experience of urban green users (Buchel and Frantzeskaki, 2015). The study of understanding the user’s perception is usually used structured questionnaires. However, the ecological concept is ambiguous, so it is difficult to explain personal recognition. As an alternative, there is a research method that divides various perspectives by personal review using Q-method (Buchel and Frantzeskaki, 2015; Grimsrud, Wilkinson et al., 2020).

Q methodology is a method that provides a basis for conducting systematic research on individual subjectivity. Q methodology aims to find Concourse, which means various perceptions of people inherent in expressive media such as language, photography, etc., and to reveal the structure inherent in the concept according to values (Brown, S. R., 1993).

Buchel and Frantzeskaki (2015) converted the concept of ecosystem service into a language that citizens can understand easier and collected user recognition more effective. The urban ecosystem service was reclassified as a subset of services that users can recognize directly, and the classified services were divided into statements that are easy to understand through discourse. After that, Q-Sort was presented to the users of urban parks and the user types were divided into three groups, which interpreted the difference in the perception of the subject on the urban green space. Lee, Kim et al. (2017) evaluated ecosystem services using Q methodology as subjects in the Seo-cheon tidal flat area of Korea, including local residents, tourism workers, activists, administrators, and researchers. In the process of evaluating the tidal flats, three main points (eco-value, value as a local tourism resource, and local landscape value causing various activities) were found, and it offer a cooperative decision-making method was proposed as a means to resolve the conflict of opinions in the area.

Previous studies on the evaluation of perceived naturalness mainly studied the relationship between visual recognition and preference in urban green spaces using photographs (Carrus, Laforteza et al., 2013; Hofmann, Westermann et al., 2012; Milcu, Sherren et al., 2014). However, environmental perception is clearly accepted through multiple senses and is not limited to only vision (Velarde, Fry et al., 2007). The survey through photographs provides direct visual stimulus to individuals, limiting their judgment by other senses, with a visual-dependent research method. Cognitive bias, which is evaluated more highly by naturalness for familiar space Carrus, Laforteza et al. (2013) can occur.

2.3 Research process

The study interviewed the park users at six urban parks in Seoul as a preliminary survey and collected users' opinions.

As shown in *Table 1*, the characteristics of natural space perceived by users were summarized into five sensory categories based on interviews with 136 users.

Table 1. Perceived Natural Elements by Seoul 136 Urban Parks Users in interview

Space Category		Cognitive elements mentioned in statement					
		Nominal scale	Details				
			Visual	Aural	Olfactory	Tactile	Feeling
Natural space	Deciduous / Coniferous/ Mixed forest	Forest	Leaves/ Maple Tree, Branch	Wind sound The sound of fallen leaves	Grass smell .	Shade .	Cozy Dense-ness
	Natural grassland/ other grassland	Hills /Fields	grassland
	Wetland/Lake	Ponds/ Lakes/ Rivers	Wave, Reflection	Water sound	.	Moisture	Openness
	Walkway/ Trail	Earth	Soil	.	Soil smell	Moistness	Vibrant
	Ecology/ Biodiversity	Herd of birds	Birds, Fish, Worms, Insects	Bird sound .	.	.	Alive .
	Other elements	Sky/ Air	Air pollution	.	Air	Coolest	Refreshing Softness

Next, we conducted a Q-sorting survey of 75 users who have frequently used and 6 parks using 17 selected Q-statements (Table 4). The survey of park interviews was conducted from October 4, 2020 to November 7, 2020. Q-method is a research method to find Concourse (meaning integration) inherent in the way of expression such as language, photography, etc. (Brown, S. R., 1993). Concourse means the agreed consciousness that exists in people's perception, and it is possible to find out the viewpoint of the individual by discovering the meaning of integration. The spatial nature elements in urban parks are divided into spatial and sensory sub-elements based on the collected conversation. Statistical significance was verified by using "R software q-method package" In the process of selecting P-set, researchers adopted a nonprobability sampling method: Q-sorting was carried out to distribute a statement about the benefits available in parks to respondents and to give the score. (The range of 'Most agree [+3]' as 'Most Disagree [-3]'), (Figure 3).

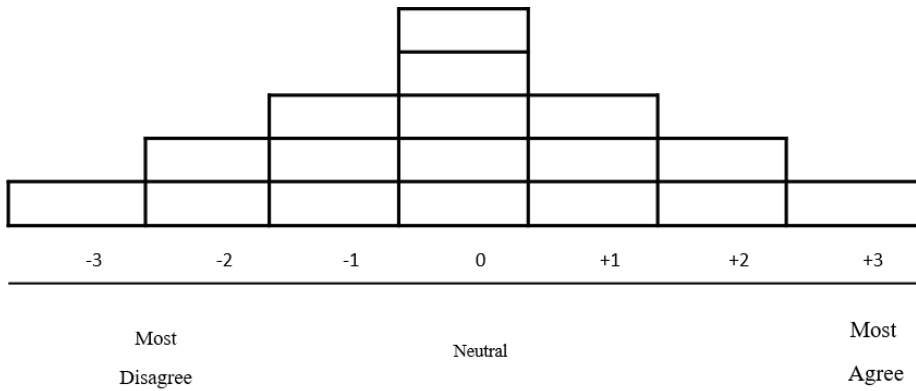


Figure 3. Q sorting pyramids

Table 2. Q statement package

NO.	Statement	Category
1	A place with beautiful and well-shaped trees, is highly natural.	Visual & Time flow
2	A quiet, low-density space is highly natural.	Feeling
3	The landscape with grass or wildflowers under the trees is highly natural.	Visual
4	A landscape with wide fields is highly natural.	Visual
5	The scenery of reeds in waterside or lakeside is highly natural.	Visual
6	Cherry blossoms, maple leaves, and other seasonal change are highly natural.	Visual & Time flow
7	Places where you can see wildlife, such as squirrels, are highly natural.	Visual & ecology
8	Unpaved roads are highly natural.	Tactile
9	'A space with a high feeling of freshness in the forest is highly natural.'	Feeling
10	Spaces with a lot of grass, flower and fruit smells are highly natural.	Olfactory
11	The place where you feel quietly surrounded by forests without being disturbed by others is highly natural.	Feeling
12	Spaces where you can hear wildlife sounds, such as birdsong highly natural.	Auditory
13	The space where you can hear the sound of flowing water such as streams and ditches is highly natural.	Auditory
14	Visiting forests left in high-density cities makes you feel more natural.	Feeling
15	The space where felt the gradient from topography is highly natural.	Time flow
16	The place where mature and historic tree stands is highly natural.	Time flow
17	The appearance of tree communities is highly natural.	Visual

3. RESULTS AND DISCUSSION

3.1 Grouping according to the Perception of Naturalness in Urban Parks

Q sort data were analyzed using R package Qmethod (Ver 1.5.5) and the factor array matrix provided was used to determine how each perception of group was evaluated in the factor. In Q method, factors explain different criteria or values for the evaluation target, so they can be called Narrative Group with different evaluation tendencies ([Grimsrud, Wilkinson et al., 2020](#)).

And then the results were classified by each explanatory group of subjects (P set) based on the 'Lad.and.flag' value provided by qmethod (Ver 1.5.5). In qmethod (Ver 1.5.5), each subject's evaluation value is classified

based on the load value corresponding to each factor, and each subject's P set is flagged as a dummy variable.

As a result of analyzing Q-sort survey value for 6 natural space characteristics of Seoul city, 75 residents (P set) were classified into 6 factors such as *Table 3*. The positive value in *Table 3* means the space that users perceive as having high naturalness, while the negative value means that the space in the park is relatively artificial.

Table 3. Factor array matrix

Statement	Category	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6
A place with beautiful and well-shaped trees, is highly natural.	Visual & Time flow	0	-2	-1	0	-2	3
A quiet, low-density space is highly natural.	Feeling	-2	0	0	-2	-1	-3
The landscape with grass or wildflowers under the trees is highly natural.	Visual	0	0	1	-2	-3	0
A landscape with wide fields is highly natural.	Visual	-1	-1	1	0	0	0
The scenery of reeds in waterside or lakeside is highly natural.	Visual	1	0	-1	0	0	0
Cherry blossoms, maple leaves, and other seasonal change are highly natural.	Visual & Time flow	0	-1	-3	1	0	0
Places where you can see wildlife, such as squirrels, are highly natural.	Visual & ecology	3	-1	3	0	0	2
Unpaved roads are highly natural.	Tactile	-3	1	0	-1	0	1
A space with a high feeling of freshness in the forest is highly natural.	Feeling	1	1	0	2	1	-2
The space with a lot of grass, flower and fruit smells is highly natural.	Olfactory	0	1	2	0	2	1
The place where you feel quietly surrounded by forests without being disturbed by others is highly natural.	Feeling	2	3	0	3	1	-1
Spaces where you can hear wildlife sounds, such as birdsong and worms, are highly natural.	ecology	2	2	2	-1	2	2
The space where the sound of flowing water such as streams and ditches is heard is highly natural.	Auditory	0	2	-1	1	1	0
Visiting forests left in high-density cities makes you feel more natural.	Feeling	-1	-3	-2	-3	3	-1
The space where felt the gradient from topography is	Topography	-1	-2	1	1	-1	-2

Statement	Category	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6
highly natural.							
The place where mature and historic tree stands is highly natural.	Time flow	-2	0	0	2	-1	1
The appearance of tree communities is highly natural.	Visual	1	0	-2	-1	-2	-1

*Bold : 2(-2) or more

The number of factors finally adopted can be determined by the researcher according to the purpose of the study. In this study, the number of factors to be used for analysis was determined based on the relation matrix between factors provided by qmethod (Ver 1.5.5).

The PCA principal component analysis results derived the 15 unique factors at first. The Q-method factors explain potential groups with different values of perception or evaluation. The factors can be understood as narrative groups by the difference in perceived naturalness by the subjects (P set). The varimax rotation was performed in the analysis to clarify the interpretation. The n-load is the number of respondents (P-sets) who are judged to be corresponding to each factor based on the Z score, and the factors were selected by referring to the eigenvalue, extended variation, and reliability. The eigenvalue of the six factors is 51.04601, which explains 68.1% of the total sample (Table 4).

Table 4. Factor-to-factor statistical verification result

	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Total
<i>nload</i> (P-set)	10	10	8	7	5	4	44(n)
<i>Eigen</i> <i>value</i>	10.8061 5	10.6012 7	9.77560 8	7.25697 7	6.97049 7	5.63551 1	51.043
<i>explaine</i> <i>d</i> <i>variatio</i> <i>n</i>	14.4081 9	14.1350 3	13.0341 4	9.67596 9	9.29399 6	7.51401 5	68.06
<i>reliabilit</i> <i>y</i>	0.97561	0.97561	0.96969 7	0.96551 7	0.95238 1	0.94117 6	-

3.2 Interpretation: People's Perceptions of Naturalness

Most people belong to the first group. Those in this group are mostly in their 20s. They chose: "Places where you can see wildlife, such as squirrels, are highly natural." (+3) In addition, they prefer auditory stimuli, such as birdsong and other sounds from wild animals. They see various animals and feel that the colorful spaces that arouse the various senses are natural, auditory, visual and spatial. Therefore, those in this group expect to enjoy various natural stimuli in the park.

The second is the group of people who love to meditate in serene woodlands. Seventeen of the total respondents are in this group, more women than men. They identify "nature" and "forest" in the same light. In their conversation, "forest" is the most-emphasized place of recognition and the most-used space in the park. They enjoy the forest as they can absorb the

feeling of "deviation from the city" and feel a "completely cozy" sense. Thus, this sense of satisfaction made them visit the park. They prefer to: "sit alone, and rest quietly under lush trees." They want "hidden spaces in the forest" where quiet contemplation can be enjoyed. Also, they responded that they were "sensitive to hearing." Therefore, they visit urban parks to avoid the noise of the city.

The third group is the type that appreciates a delicate recognition of microscopic elements in the park, ecological characteristics like microbes and wild animals, like natural nature. A total of 12 samples was included in this group. These groups answered: "Places where you can see wildlife, such as squirrels, are highly natural." (+3) The second most highly ranked answers were: "Spaces where you can hear wildlife sounds, such as birdsong and worms, are highly natural" (+2), and "The spaces with a lot of grass, flower and fruit smells are highly natural." (+2) They preferred to "observe" various animals and plants in open fields or in the squares in the park.

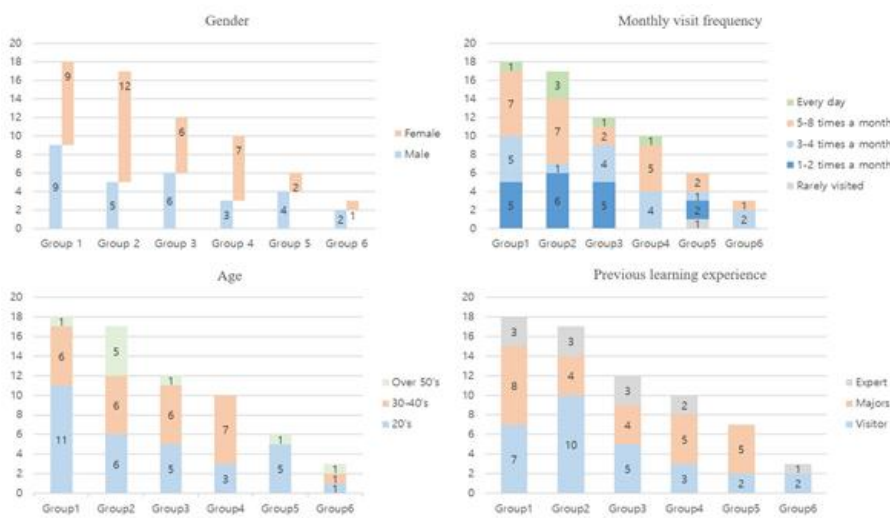


Figure 4. Participants' demographic characteristics

The fourth group is a group in which, in 10 samples, they perceived mainly nature 'historicity' and 'accumulation of time'. And also they are related to the lushness of trees in 'nature'. There are more women than men in this group. They recognize that naturalness is prominent in forests with rich canopy, and that 'the denseness of forests' is evidence of accumulation time or circulation of time.

The fifth group recognizes urban parks as nature in preparation for the development density of surrounding cities rather than the 'nature' itself. Most of them are majors. The other five groups had assessed that "the forest left in a high-density city." is not natural. However, this group strongly agreed (+3) to 'Visiting forests left in high-density cities makes them feel more natural'. The value of the city park emphasized by them is 'providing convenience for nearby users by green space' and it should provide the utility for their life. The sixth group is the most focused on the nature of naturalness, and they evaluate it as natural by looking at the tree with beautiful shapes as willow.

The smallest number of samples among the six groups were applied, but they strongly agree with the statement that 'when looking at beautiful and well shaped trees is highly natural. (+3)' However, there is a limit to infer demographic characteristics in these groups, because the number of samples

is too small. They define trees that flourish with their own strength in the quality soil and environment of nature as 'beautiful trees'.

3.3 Consensus and Distinguish statement: The Differences in the Perception of Naturalness in Urban Park Users Group

In this study, the characteristics of 17 natural spaces revealed in Q-specific texts were analysed by factor values and standard scores, and the representative natural cognitive types were explained accordingly. Out of a total of 75, 66 participants were divided into six groups, including redundant cases. Some sentences were similarly rated as highly natural among each group, but there were clear differences in perception of naturalness.

3.3.1 Consensus in the perception of naturalness

Table 5. Consensus statement

Consensus of statements judged to have high naturalness		f1	f2	f3	f4	f5	f6						
Places where you can see wildlife, such as squirrels, are highly natural.	ecology	3	1.27	-1	-0.33	3	1.8	0	-0.31	0	0.0	2	1.4
The space with a lot of grass, flower and fruit smells is highly natural.	Olfactory	0	0.32	1	0.64	2	1.1	0	0.04	2	1	1	0.3
Consensus of statements judged to have low naturalness		f1	f2	f3	f4	f5	f6						
A quiet, low-density space is highly natural.	Feeling	-	-1.79	0	-0.32	0	-	-	-1.07	-	-	-	-
The space where felt the gradient from topography is highly natural.	topography	-	-1.02	-2	-1.24	1	1.0	1	0.83	-	-	-	-

There are two statements that most groups agreed have high naturalness. The first is 'places where you can see wildlife, such as squirrels, are highly natural,' and another is 'places where you can see wildlife, such as squirrels, are highly natural.' In other words, this result reveals that urban park users can judge that naturalness is high if they have an excellent natural environment, or one suitable enough for wild animals to inhabit, in urban parks. (Table 5) This is related to the visual sense, where the space does not mean planning elements such as zoos, which are artificially installed by humans. Instead, it means a good environment in which biodiversity is preserved. In an environment where other species of animals or plants live well, they can smell abundant smells and feel the freshness of such a space.

On the other hand, there are two statements that are evaluated as relatively low in nature for all groups: 'a quiet, low-density space is highly natural' and 'the space where the gradient from topography is felt is highly

natural'. Regarding this, people think that a space with high naturalness means a place with a rich vertical landscape due to a high density of trees and vegetation. Participants were reminded that a low-density and quiet space was a space that felt like a 'wilderness and unpaved road'. Also, the height of the terrain did not give most people the feeling of being 'natural'.

3.3.2 Distinguishing the perception of naturalness

The statement that a difference in perception between groups is found because the Z-score deviation is large is as follows. When the questions are divided into perception consciousness, these things are revealed as differences in sensory use between groups. The senses that affect the perception are "visual; or perception of physical changes in time flow," the "feeling" when entering space, and finally "auditory sensitivity."

3.3.2.1 Distinguishable categories of "visual"/"time flow"

In the visual category, regarding the statement, "A place with beautiful and well-shaped trees is highly natural," only the sixth group evaluated it as "natural." (+3) The "beautiful tree" recognized by Type 6 means a tree that has grown with its own power in the quality of nature and its environment, and contrasts with the reminder of "topiary trees" by other types of people for the same statement. (*Appendix 1*)

The "Cherry blossoms, maple leaves, and other seasonal senses are very natural," and "The appearance of tree communities is highly natural" statements were divided into groups 3 and 4. Group 4, who knows the flow of time, recognized that the factors that can make you feel the change of the season are highly natural (+1), while Group 3 judged that trees that were intentionally planted for aesthetic demand had low naturalness. (-3) Also, Group 4 agreed with the statement, "The places where mature, historical trees stand are highly natural." Even though a tree was artificially planted by humans, they perceive that a tree has a "natural ecosystem" according to the "historicity of time."

3.3.2.2 Distinguishable categories of "feeling"

In the assessment of "sense of space," Groups 2 and 4 with high preferences for forests agreed with the two statements. The first is: "A space with a high feeling of freshness in the forest is highly natural." The second thing is: "The place where you feel quietly surrounded by forests without being disturbed by others is highly natural." It can be inferred that 2 groups like "forest" spaces, especially in urban parks, and they especially prefer "places where they can meditate quietly."

Most of the groups evaluated the forests in densely developed cities as being less natural, but Group 5 responded that they felt very high naturalness when they visited the "forests left in high-density cities" because they perceive the degree of the natural state compared with the density of the surrounding city, the crowded tall buildings outside the park area, they found it to be more natural in the park. (*Appendix 2*)

3.3.2.3 Distinguishable categories of "auditory" sense

In the category of auditory perception (*Appendix 3*), there is a difference between the other groups and 3 groups. They evaluated "spaces with

flowing water, such as rivers and ditches," as relatively unnatural, because as a landscape element, people can hear water sounds in artificial hydroponic spaces.

All the groups, except for 4 groups, judged that a space where birdsong can be heard is highly natural. (+2) Group 4 ranked the naturalness of wildlife sounds low, because they emphasized: "Natural circulation or time accumulation." They said, "Spaces where you can hear wildlife sounds, such as birdsong" can be made by artificial intent immediately, and you cannot judge such temporary elements as natural.

4. CONCLUSION

We continue to make efforts to analyse various space-consumption trends that reflect individual personalities and lifestyles and utilize them in space planning. Since urban parks are essential spaces in city life, it is necessary to satisfy as many people as possible. However, it is difficult to create a public space that satisfies all the needs of many different individuals.

Therefore, this study defines the attractiveness of urban parks as "perceived naturalness" and distinguishes the "perceptions" of users who interpret "natural space" by using the Q-method. Users' perceptions of urban parks can also be different, depending on their personal experiences of natural spaces, even in the same landscape. The study found that these differences are a result of their past experiences, personal preferences, and psychological statuses.

So, what are the users' natural recognition types and the characteristics of urban parks in Seoul? To summarize: six groups have differences in their perceptions and valuations of naturalness. The first group can be said to be composed of dynamic types who enjoy various landscapes. The second is a group of people who love to meditate in serene woodlands. The third group wants to observe animals and considers the ecosystem to be important. The fourth group is composed of those who love and are sensitive to the changing seasons. The fifth group recognizes nature through the contrast between the buildings and the natural environment in a city. The last group is made of those who pursue the conservation of old trees or of the existing natural environment itself.

Each group had different ways of interpreting their perception of landscape naturalness, according to the categories of each sense, but they also saw common characteristics of "highly-natural space," or "space with less naturalness." In a consensus statement, it was revealed that places where wildlife appeared, or where you could smell many flowering trees, seemed highly natural to everyone. Conversely, a flat landscape with less vegetation was found to have less naturalness, in their perception. Therefore, most people think that rich landscapes are highly natural in terms of the visual, auditory, and biodiverse categories.

Also, what are the commonalities and differences in the natural-perception type? the results of the three sensory categories, in visual aspect Groups 6 was sensitive to natural tree visual form, and there was a difference in the judgment between the groups according to the time flow evaluation of visual nature. In the spatial impression such as "feeling", Groups 2 and Groups 4 sensitively feel the place spatial impression of natural space. Two groups conspicuously feel high sensual satisfaction as a space of meditation and relaxation. Also, In the category of auditory

perception, Group 3 clearly distinguished the sounds of nature; they particularly like the sounds produced by natural animals and ecosystems, so they can conclude that they are sensitive to auditory stimuli.

How distinct is this difference? The main conclusion of this study is that the preferred stimulus for each group is different even after experiencing the same nature in the urban park "natural space".

This study has a limitation that the deviation of Q-method participating group is severe and the correlation between perceived naturalness perception according to age or social variables is not found. So, next study should be conducted in consideration of the perceived naturalness of urban parks, the age of the samples, and socioeconomic characteristics in the following studies.

In the future, more research on the "clear differences in the perception of landscape naturalness" is needed, and themed spaces in parks that target different groups is needed to make the limited green resources in the city more efficient. For forest-loving groups, it is necessary to create forest space at a sufficient distance from the city. For the group pursuing various natural experiences, park amenities should be increased. Planning a small space in the park to "observe" various animals and plants can be a good space plan for the animal lovers. For the group that requires qualitative management rather than physical management, it is necessary to make an environment that strives for growth management, such as by helping trees grow in one place for a long time.

AUTHOR CONTRIBUTIONS

Conceptualization, Kim, D.E. and Son, Y.H.; methodology, Kim, D.E. and Son, Y.H.; software, Kim, D.E.; investigation, Kim, D.E.; resources, Kim, D.E.; data curation, Kim, D.E. and Son, Y.H.; writing—original draft preparation, Kim, D.E.; writing—review and editing, Kim, D.E. and Son, Y.H.; supervision, Son, Y.H. All authors have read and agreed to the published version of the manuscript.

ETHICS DECLARATION

The authors declare that they have no conflicts of interest regarding the publication of the paper.

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APPENDIX: RESULT OF STUDY

Appendix 1. Distinguish perception of ‘Visual’ / ‘Time flow’ categories

Statement	Percepti on Categor y	f1	f2	f3	f4	f5	f6						
A place with beautiful and well-shaped trees, is highly natural.	Visual	0	-	-2	-	-1	-	0	0.	-2	-	3	1.
	Time flow		0.	1.	0.	2	1.	6					
Cherry blossoms, maple leaves, and other seasonal change are very natural.	Visual	0	0.	-1	-	-3	-	1	0.	0	0.	0	0.
	Time flow		2	0.	7	5	7	5	9				
The place where mature and historic tree stands is highly natural.	Visual	1	0.	0	0.	-2	-1	-1	-	-2	-	-1	-
	Time flow		9	1	2	9	2	4	6	8	1	0.	0.

Appendix 2. Distinguish perception of ‘Feeling’ categories

Statement	Perceptio n Category	f1	f2	f3	f4	f5	f6						
'A space with a high feeling of freshness in the forest is highly	Feeling	1	0.	1	0.	0	-	2	1.	1	0.	-2	-
			9	9	0.	4	9	1.					
			3	1	1	6	3	2					

Statement	Perception Category	f1	f2	f3	f4	f5	f6
natural.'							
The place where you feel quietly surrounded by forests without being disturbed by others is highly natural.	Feeling	2	1. 3	1. 0	0. 3	1. 1	0. -1
Visiting forests left in high-density cities makes you feel more natural.	Feeling	-1	- 0. 5	-3 1. 9	- 1. 2	-3 1. 7	- 3 1. 7

Appendix 3. Distinguish perception of 'Auditory' categories

Statement	Perception Category	f1	f2	f3	f4	f5	f6
Spaces where you can hear wildlife sounds, such as birdsong and worms, are highly natural.	Auditory	2	1. 2	1. 1. 2	1. 4	-1 0. 8	- 2 1. 2
The space where the sound of flowing water such as streams and ditches is heard is highly natural.	Auditory	0	0. 2	1. -1	- 0. 1	1 0. 3	0 0. 6