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Citation for published version (APA):

van Dinter, M., Kools, M. A. C., Dane, G. Z., Weijts-Perrée, M., Chamilothoni, K., van Leeuwen, E. S., Borgers, A. W. J., & van den Berg, P. E. W. (2022). Urban Green Parks for Long-term Subjective Well-being: Empirical Relationships between Personal Characteristics, Park Characteristics, Park Use, Sense of Place, and Satisfaction with Life in the Netherlands. *Sustainability*, 14(9), Article 4911. <https://doi.org/10.3390/su14094911>

DOI:

[10.3390/su14094911](https://doi.org/10.3390/su14094911)

Document status and date:

Published: 01/05/2022

Document Version:

Publisher's PDF, also known as Version of Record (includes final page, issue and volume numbers)

Please check the document version of this publication:

- A submitted manuscript is the version of the article upon submission and before peer-review. There can be important differences between the submitted version and the official published version of record. People interested in the research are advised to contact the author for the final version of the publication, or visit the DOI to the publisher's website.
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Article

Urban Green Parks for Long-Term Subjective Well-Being: Empirical Relationships between Personal Characteristics, Park Characteristics, Park Use, Sense of Place, and Satisfaction with Life in The Netherlands

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Citation: van Dinter, M.; Kools, M.; Dane, G.; Weijs-Perrée, M.; Chamilothoni, K.; van Leeuwen, E.; Borgers, A.; van den Berg, P. Urban Green Parks for Long-Term Subjective Well-Being: Empirical Relationships between Personal Characteristics, Park Characteristics, Park Use, Sense of Place, and Satisfaction with Life in the Netherlands. *Sustainability* **2022**, *14*, 4911. <https://doi.org/10.3390/su14094911>

Academic Editor: Richard Hauer

Received: 24 February 2022

Accepted: 17 April 2022

Published: 19 April 2022

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Abstract: As our living environment is becoming increasingly urbanized, this puts the livability, health, and quality of life in cities under pressure. Due to the urbanization process, urban green spaces are under threat of becoming scarce, while it is recognized that these green spaces can positively contribute to the subjective well-being of citizens. It is thus important to maximize the use and benefits derived from green spaces by designing them as positively experienced places. The aim of this research is to gain more empirical insights on the relationships between personal and park characteristics, park use behavior, sense of place, and park visitors' long-term subjective well-being (i.e., life satisfaction). An online questionnaire was administered to participants in two medium-sized cities in The Netherlands, namely Eindhoven and 's-Hertogenbosch. Data were analyzed using a structural equation model. The results of this study show that the appreciation of facilities and the absence of disturbances positively influence the use and sense of place of a park. Furthermore, the findings show that sense of place has a positive influence on life satisfaction. The findings can be used by designers and policy-makers as guidelines to improve existing parks or to design new parks that support the subjective well-being of individuals in The Netherlands.

Keywords: urban green parks; sense of place; park use behavior; subjective well-being; satisfaction with life; structural equation modeling

1. Introduction

Urbanization is a process that is on the global political agenda of today. Currently, 55% of the population is living in urban areas, and the urbanization rate is far from slowing down [1]. In 2050, it is expected that over 68% of the world's population will live in urban areas. The growth of urban areas poses many environmental challenges, such as increasing levels of pollution and densification in cities, that have negative impacts on the quality of life (QoL) of residents. Therefore, the World Health Organization (WHO) launched an initiative towards healthier cities [2]. This 'Healthy Cities' initiative is meant to make urban planners more conscious about the need for planning urban spaces that support a better QoL for residents. QoL is a concept that looks at the perception of one's life and is often used in combination with the concept of well-being [3]. In the literature,

the terms QoL and well-being are used interchangeably; in the present article, only the term “well-being” will be used. According to Pinto et al. (2017) [3], well-being can be conceptualized as a term related to the concepts of happiness, positive experiences or ideas, life satisfaction, pleasure, and prosperity. In this research, the satisfaction with life scale developed by Diener et al. (1985) [4] is used for the measurement of long-term subjective well-being.

It is recognized that public green spaces, such as parks, can enhance the well-being of individuals directly and indirectly, since urban green spaces enable people to become more physically active, help reduce their stress, support recreation outdoors, and connection with nature. In the existing literature, empirical support has been found for the role of park use in healthy aging [5]. A recent empirical study from Müller-Riemenschneider et al. [6] showed that participants who were prescribed weekly exercise in green parks showed a significant improvement in reported QoL compared to participants who were prescribed to standard physical activity. Moreover, research from Xiao et al. (2018) showed that large green areas in particular can limit the negative impacts of climate change by having a cooling and humidifying effect that prevents urban heat island effects [7]. Therefore, large green areas become more attractive for people during heat waves.

The literature has also often discussed that a positive perception of parks can increase their use [8], and that the perception of parks is influenced by the park characteristics and by the users’ personal characteristics [9]. Furthermore, it was found that experiences in urban green spaces are a mediator between the environment and well-being [10]. In particular, the experiences and perception of parks have been found to contribute to its sense of place (a meaning attached to a place) for the park users [10]. At the same time, the sense of place experienced by a park user also contributes to the user’s well-being. Urban green park use behavior has been found to be dependent on the purpose of the park’s use (i.e., type of activity such as walking, sports, meeting), characteristics of the park (i.e., facilities, variety of vegetation), and personal characteristics of the visitors (i.e., age, household composition, education). However, knowledge about the relationships between all different aspects related to park use, sense of place, and the long-term subjective well-being of individuals is still limited. Therefore, the main goal of this study is to provide empirical insights into the personal and park characteristics that are related to park use behavior and the park experience, and into how these characteristics can be used to explain the (long-term) subjective well-being of individuals in terms of satisfaction with one’s life. The results of this current study can provide guidelines to designers and policy-makers for designing parks that support the subjective well-being of individuals in The Netherlands.

To investigate this, first, a literature review was performed, described in Section 2, which resulted in a conceptual model. Sections 3 and 4 explain the methodology of the research and the results of the study, respectively. Section 5 discusses the outcomes and the limitations of this study, and Section 6 concludes the paper with recommendations for practice and further research.

2. Literature

Exposure to nature is recognized to be highly important for people’s subjective well-being (e.g., reducing stress levels, improving mood and mental health) [11]. In this study, we use the definition of subjective well-being to mean “the degree to which an individual positively evaluates the overall satisfaction with his/her life” [12], and we used the satisfaction with life scale (SWLS) developed by Diener et al. (1985) [4] for the measurement of long-term subjective well-being. We adopted SWLS [4] because, in earlier studies (i.e., [13,14]), life satisfaction has been considered equivalent to subjective well-being and has been used for the cognitive evaluation of the circumstances of life. The SWLS is a widely used five-item scale that employs a 7-point Likert scoring system in

order to measure life satisfaction as a cognitive-judgmental process (the SWLS can be found in Table A1 of Appendix A).

Kaplan and Kaplan (1989) [15] argued that contact with nature can help with the recovery of fatigue and enables people to escape from their daily lives. Furthermore, views of nature have been found to improve people's mental health and subjective well-being [16,17]. Moreover, people living in areas with higher level of greenery have been found to report higher perceived health, which could be explained by increased physical activity [18], which then can lead to an improved health and subjective well-being. De Vries et al. (2003) [18] also argued that greenery can influence social well-being. Taylor et al. (1998) [19] found that more public green places resulted in increased face-to-face contacts and thereby improved levels of neighborhood satisfaction. Moreover, Kim and Miller (2019) [20], based on their survey of citizen attitudes and perceptions, found that green infrastructure plays an important role in promoting peaceful feelings and providing places to relax, exercise, and walk with loved ones. Green infrastructure and access to nature has been found to reduce anxiety and encourage thinking [20].

According to Andrews and Withey (1976) [21], subjective well-being consists of three components: positive affect, negative affect, and life satisfaction. Access to urban green spaces was found to positively affect all three components, with exposure to urban green leading to a higher positive affect and reduced negative affect [22,23], and the percentage of public green space in close proximity to a resident's home being related to higher reported life satisfaction [24]. Later studies by Pfeiffer et al. (2020) [25] found the reported satisfaction with the amount of neighborhood parks and open spaces to be related to higher levels of life satisfaction.

Urban green spaces have been found to affect citizens' experiences in multiple ways. According to Hartig et al. (2003) [26], contact with nature can reduce stress effects caused by traffic. Maas et al. (2009) [27] argued that use of green spaces reduces feelings of anger. Moreover, green spaces have been related to higher levels of happiness [28]. This is important for maximizing the use of urban green, as people tend to use a place more often if people feel happier there [29]. However, urban green spaces can also trigger negative affects due to issues with safety or the bad maintenance of the area [30]. All these findings from the literature indicate that access to urban green spaces, especially parks, contribute to an improved subjective well-being.

One of the means of quantifying people's experience of an urban green park is its sense of place, which is the particular experience of a person in a particular setting [31]. Experience can be described as the interaction between a person and that person's physical and social environment [32–35]. Each experience evokes an affective meaning that can vary in two dimensions, positive and negative [33]. Within that perspective, sense of place represents the meaning of a place for an individual. It is based on the interaction between that individual and the characteristics of the environment and the affective meaning that the environment has evoked for that individual. The predictive factors of sense of place can be divided into two groups, namely the cognitive factors and physical characteristics [31].

According to Stedman (2003) [36], the concept of sense of place includes the meanings attributed to a place, the place attachment, and the satisfaction with a place. In a study examining the sense of place in lakes, landscape characteristics were found to predict place satisfaction, but not place attachment; on the other hand, the meaning attributed to the lake, such as "a place of escape from civilization", was found to mediate the relationship between the physical characteristics of the landscape and the place attachment [36]. Research examining people's descriptions of favorite and of unpleasant places found that natural settings were the most often (48%) mentioned favorite places and one of the least often (5%) mentioned unpleasant places [37]. Moreover, a study by Anastasiou and Manika (2020) [38] found that the quality of leisure services, the suitability of the infrastructure for children, and bioclimatic upgrades are important determinants for the visitors' satisfaction in urban open spaces. Furthermore, in a study conducted by

Madureira et al. (2018) [39], it was found that most preferred public green space characteristics in several Portuguese cities are park amenities such as playgrounds and sport facilities. However, this study also suggested the performing of local assessments of residents' preferences about urban green spaces because these preferences may vary in different locations.

Sense of place was found to be positively related to health and well-being [40–42]. However, so far, research on sense of place has focused primarily on residential areas, and few studies have examined sense of place in the context of parks. Overall, the sense of place in a park was found to be connected to the frequency of park visits. Farnum et al. (2005) [43] argued that more park visits can lead to a more positive sense of place, or that a positive sense of place can lead to more park visits. Regardless of the direction of the relationship, it can be argued that there is a relation between the use of a park and its sense of place.

In the literature, park use behavior has been studied in combination with the subjective well-being of individuals (e.g., Hong et al. (2019) [44]), but not often in combination with experiences or sense of place. Hong et al. (2019) [44] found that the number of visits to a park influences the subjective well-being of individuals. Moreover, a meta-analysis by Barton and Pretty (2010) [45] showed an inverted U-curve relationship between the duration of green exercise (such as walking in nature) and beneficial effects on mood, with a significant change observed in the effects for small (5 min) and large durations (whole day) compared to medium (10–60 min, half a day) durations of exposure. In addition to the duration of exposure to nature, Twedt et al. (2019) [46] argued that the presence of people in an environment might act as a cue that the situation is not conducive to restoration due to the reduced privacy and opportunity for self-reflection. Similarly, Staats and Hartig (2004) [47] found that being alone increased the reported likelihood of recovery when controlling for the feeling of safety induced by the presence of other people. It could thus also be argued that both the duration of a visit and the number of people visiting the park together contribute to the subjective well-being. Furthermore, the type of activity (i.e., walking, exercise, meeting new people) was found to be a predictor for subjective well-being (e.g., [48,49]).

Personal characteristics have also been found to affect park use and experience. In the literature, the most mentioned characteristics were age, ethnicity, gender, education level, and household composition. For example, a person's age was found to influence the frequency of park visits and the preference for certain facilities in a park [48]. Ethnicity was also found to play a role in the frequency of park use, the sense of belonging, the perceived importance of maintenance of a park, and the perceived importance of vegetation type in the park [50]. Moreover, in terms of gender, women were found more likely to experience parks as dangerous [51] and were found to consider the perceived importance of maintenance, vegetation type, and ethnic representation to be more important than men [50]. The level of education was also found to influence the preferences for park use. Highly educated people were found to value green spaces more [52] and prefer denser vegetation [53]. Lastly, the composition of one's household was found to play a role in the use and experience of parks. For example, families with children were found to have a tendency to go to the parks more often [48].

Overall, the literature research presented above has provided evidence on the relationships between personal characteristics, park characteristics, park use and experience, and people's well-being. However, it has not revealed the exact structure of all these relationships in an integrated manner. The main contribution of this study is therefore to simultaneously test these relationships. Based on the reviewed literature, a conceptual model, shown in Figure 1, has been developed to visualize these relationships.

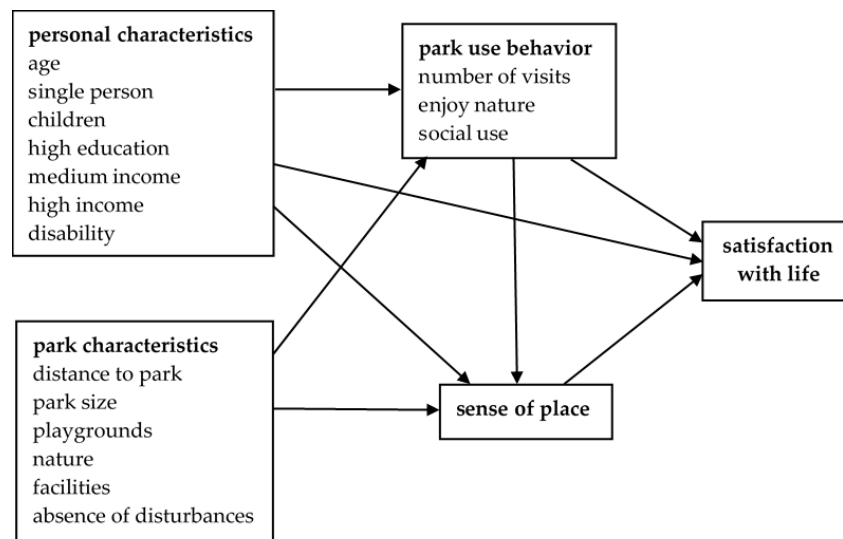


Figure 1. Conceptual model with variables and their relational directions for analysis.

As represented by this conceptual model, a positive evaluation of the park's characteristics is hypothesized to be related to higher park use and the sense of place. It has been found that the way people use and experience the environment could mediate the relationship between the perception of a park and people's well-being. As sense of place is an overall experience that is developed over time, we assume that park use frequency positively contributes to sense of place. This study examines to what extent park use behavior directly contributes to people's well-being and to what extent this effect is explained via the sense of place in the park. Personal characteristics could also directly affect well-being and are added as control variables. In order to test these relations presented in Figure 1, we collected data from park users in The Netherlands, as is discussed in the next section.

3. Method

This section describes the data collection procedure, the data collection instrument, and the analysis approach.

3.1. Data Collection Procedure

The main goal of this study is to provide empirical insights into the personal and park characteristics that are related to park use behavior and park experience, and into how these characteristics can influence the subjective well-being of individuals in terms of satisfaction with one's life. To empirically test the relationships, data were collected in The Netherlands in a cross-sectional approach using an online questionnaire in the platform LimeSurvey (Hamburg, Germany). This questionnaire was distributed among adults living in Eindhoven and 's-Hertogenbosch, two medium-sized cities in the south of The Netherlands, via social media and via the survey panels of both municipalities. The data were collected in July 2020, during the COVID-19 pandemic, but respondents were asked to answer the questions considering the time before the pandemic. A total of 697 participants completed the questionnaire, but only 563 of them were living in either Eindhoven or 's-Hertogenbosch, and their answers were thus considered valid for this analysis.

This study and associated survey were part of a wider project on urban park characteristics, park use, and park experience in The Netherlands. Due to that, the survey consisted of two parts. The first part of the survey consisted of a forced choice task, wherein participants chose their preferred option from pairs of videos of simulated walks in parks with different characteristics, the outcomes of which were reported in Van Vliet

et al. (2021) [54]. In the second part of the survey, participants were asked to report in a consecutive order on their demographic characteristics, their subjective well-being, their park use and parks they visited, and lastly their experience of a particular park, selected randomly from the parks they reported to visit. Each of these elements is described further in Section 3.2 below. The data collected from the second part of the survey were used for this paper.

The duration of the survey was estimated to be around 25 min, but there was no time restriction. Participants provided informed consent prior to participating in the survey. After the completion of the survey, participants were thanked and could join a raffle, wherein they had a chance of winning a gift card worth 25 EUR. This study was approved by the Ethical Review Board of the Eindhoven University of Technology.

3.2. Measures

In the questionnaire, respondents specified which parks they used in 2019 in either Eindhoven or 's-Hertogenbosch, depending on their city of residence. Figures 2 and 3 show the distribution of the parks in each of the two cities that were included in the questionnaire. One of the parks that the participants reported to have visited in the last year at least for a couple of times was randomly selected from the responses of each participant, and participants were asked to fill in questions related to park use behavior, experiences with the park, and the (perceived) characteristics of that particular park.

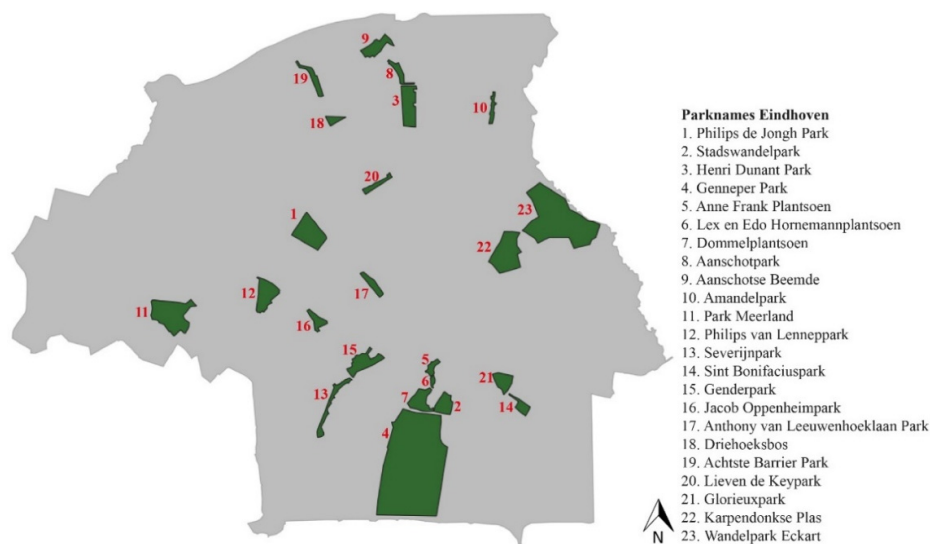


Figure 2. Parks in the city of Eindhoven that were included in the questionnaire.

For park use behavior, several elements were included in the questionnaire, consisting of questions concerning how often participants visited that park on average per month and which activities they performed. Based on the literature, the following activity types were considered: walking, enjoying nature, sitting/relaxing, letting children play, meeting with family/friends, meeting new people, for events, exercising. Respondents answered for each activity if they visited the park for that reason.

Concerning park characteristics, objective park characteristics and subjective appreciation of park characteristics were considered. The objective park characteristics considered in this research were the following: size of the park, presence of water, type of pavement, number of benches, and number of playgrounds. QGIS (an open-source geographical information system software) was used to measure the distance from the respondent's home (from a four-digit postcode) to the park. Regarding the appreciation of park characteristics, a distinction was made between natural and facilitatory elements in parks. A statement was created for each element, and respondents were asked to rate

their satisfaction on a 7-point Likert scale. A total of 12 statements was used for natural elements and 14 for faciliatory elements. These statements can be found in Table A2 of Appendix A.

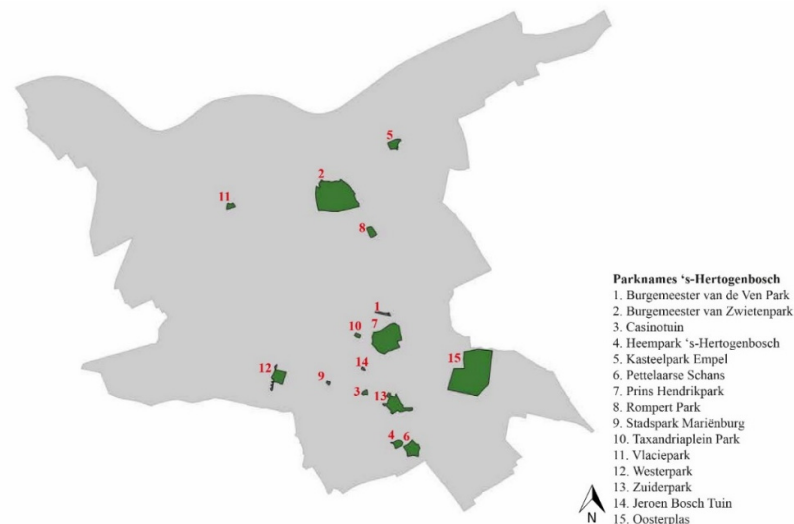


Figure 3. Parks in the city of 's-Hertogenbosch that were included in the questionnaire.

To measure the participant's experience of the selected park, the concept of sense of place was used. The study of Jorgensen and Stedman (2001) [51] was used as a framework for the statements related to sense of place. The current study rephrased the statements to make them more suitable for the aim of the study. In total, seven statements related to sense of place were included, also presented in Table A3 of Appendix A.

The satisfaction with life scale, developed by Diener et al. (1985) [4], was used for the measurement of long-term subjective well-being. Respondents were asked to indicate for five statements how much they (dis)agree with each of the statements on a 7-point Likert scale (ranging from strongly disagree to strongly agree). Respondents were also asked to respond to questions related to their personal characteristics, such as age, gender, educational background, ethnicity, occupation status, income, and household composition.

3.3. Analytical Approach

The data were analyzed with a structural equation model (SEM). This model gives the opportunity to study both latent and observed variables and at the same time estimate the relationships between different types of variables. The SEM consists of a measurement model that specifies how the indicators are related to the latent variables and a structural model that specifies the relationships between the endogenous and exogenous latent variables. In this study, the model was estimated using the statistical software package LISREL version 8 [55]. Figure 1 shows the variables that were considered in the model, as discussed earlier in Section 2.

4. Results

4.1. Sample Description

This study used data from completed surveys by 563 respondents who live in the Dutch cities of Eindhoven or of 's-Hertogenbosch. Therefore, we compared the sample to the population of these two cities. The sample is not entirely representative of the population of the two cities, because there is an overrepresentation of Dutch people, older people (>46 years old), higher educated people, and couples without children. Table 1 presents the descriptive statistics of participants' personal characteristics.

Table 1. Descriptive statistics of participants' personal characteristics and comparison with statistics Netherlands (CBS) [56,57].

Personal Characteristics		Eindhoven (%) (CBS, 2020)	Sample Eindhoven (%)	's-Hertogenbosch (%) (CBS, 2020)	Sample 's-Hertogenbosch (%)
Age	15–30 years	27.0	14.6	22.5	17.1
	31–45 years	25.0	14.6	23.0	9.5
	46–65 years	28.5	35.1	33.4	41.2
	>65 years	19.5	35.7	21.1	32.2
Gender	Female	48.5	45.6	50.6	46.2
	Male	51.5	54.1	49.4	52.3
	Other	1.0	0.3	0.0	1.5
Education level	Low	28.0	10.2	25.0	6.5
	Moderate	37.0	23.4	37.5	33.2
	High	35.0	66.5	34.5	60.3
Ethnicity	Dutch	86.6	91.8	95.8	96.5
	Western immigrant	6.3	5.5	2.3	1.0
	Non-Western immigrant	7.1	2.7	1.9	2.5
Occupation status	Unemployed	-	8.5	-	7.5
	Part-time (<12 h)	-	4.4	-	5.0
	Part-time (12–20 h)	-	4.7	-	4.5
	Part-time (21–35 h)	-	11.0	-	20.1
	Full-time (>35 h)	-	33.5	-	26.6
	Retired	-	37.9	-	36.2
Net yearly household income	<20.000 euro	-	11.8	-	13.6
	20.000 till 50.000 euro	-	42.3	-	38.2
	>50.000 euro	-	22.5	-	24.6
	No answer	-	23.4	-	23.6
Household composition	Single	45.0	21.7	37.2	26.6
	Single parent with children	23.5	2.7	26.8	2.5
	Couple with children	24.5	14.8	28.8	19.1
	Couple without children	6.4	56.3	6.7	46.2
	Other compositions	0.6	4.4	0.5	5.5
Disabilities	No	-	81.9	-	80.9
	Yes	-	18.1	-	19.1

4.2. Analysis and Results

Structural equation modeling (SEM) was used to analyze the collected data. Table 2 shows the goodness of fit of the model. The model has an RMSEA of 0.058 and the Goodness of Fit Index (GFI) of the model is 0.92. Therefore, the model shows a reasonable to good fit overall, which means that it can be used to investigate the studied relationships further.

Tables 3 and 4 show the measurement model of the SEM, indicating the relationship between the latent variable and its indicators. The tables show the factor loadings of the latent variables as well as the Composite Reliability (CR) and Average Variance Extracted (AVE) for the latent variables. The CR represents the internal consistency of the items. A high CR indicates that the items measure the same construct. CR can be seen as an “indicator of the shared variance among the observed variables used as an indicator of a latent construct” [58]. AVE is a measure of the amount of variance that is captured by a

construct in relation to the amount of variance due to measurement error [58]. Fornell and Larcker (1981) [58] recommended a CR value greater than 0.6 and an AVE greater than 0.5. As shown in Table 3, 9 of the 12 statements for natural elements in the questionnaire were used in the model, and six and two statements were used for facilities and for disturbances, respectively. The full list of statements related to natural and facilitatory elements can be seen in Appendix Table A2.

Table 2. Goodness of fit of the model.

Goodness-of-Fit of the Model	
Degrees of freedom	1571
Minimum Fit Function Chi-Square	4214.80
Chi-Square/Degrees of Freedom	2.68
Root Mean Square Error of Approximation (RMSEA)	0.058
90 Percent Confidence Interval for RMSEA	0.056; 0.059
Goodness of Fit Index	0.92
Normed Fit Index	0.90
Non-normed Fit Index	0.93
Comparative Fit Index	0.94
Standardized RMR	0.066

Table 3. Factor loadings of exogenous latent variables.

Variables	Nature	Facilities	Disturbances
Bushes	0.84		
Trees	0.86		
Flowers	0.59		
Grass	0.69		
Water	0.54		
Variety of Vegetation	0.87		
Arrangement of Nature	0.87		
Nature Sounds	0.62		
Maintained	0.73		
Quality Facilities		0.69	
Benches		0.66	
Play Facilities		0.57	
Exercise		0.57	
Walking Paths		0.78	
Pavement Paths		0.74	
No Noise			0.66
No Odor			0.90
Composite Reliability (CR)	0.916	0.830	0.673
Average Variance Extracted (AVE)	0.555	0.453	0.377

Table 4. Factor loadings of endogenous latent variables.

Variables	Activity: Enjoying Nature	Activity: Social Use	Sense of Place	Satisfaction with Life
Activity: Walk	0.52			
Activity: Enjoy nature	0.92			
Activity: Sit		0.54		
Activity: Let children play		0.43		
Activity: Meet family/friends		0.71		
Activity: Meet new people		0.61		
Activity: Events		0.54		
Activity: Exercise		0.45		
This park is one of my favorite urban parks.			0.79	
I really miss this park when I am away for long.			0.74	
This park reflects the type of person I am.			0.82	
This park makes me feel like I can be myself.			0.77	
This park says very much about me.			0.74	
This park meets my needs better than any other park.			0.77	
This park is a good place to do the things I enjoy most.			0.77	
There are better parks than this park.			0.71	
In most ways, my life is close to ideal.				0.90
The conditions of my life are excellent.				0.89
I am satisfied with my life.				0.92
I have gotten the important things I want in my life.				0.81
If I could live my life over, I would change nothing.				0.63
Composite Reliability (CR)	0.585	0.721	0.918	0.920
Average Variance Extracted (AVE)	0.442	0.308	0.584	0.700

As can be seen in Table 4, eight activity types resulted in two latent variables regarding park use behavior; two activity types (walk and enjoy nature) were gathered in a latent variable named ‘enjoying nature’, and six activity types (sit, let children play, meet family/friends, meet new people, events, and exercise) were gathered in a latent variable named ‘social use’. The CR value of enjoying nature is very close to 0.6, and all other CR values are well above this recommended value. The AVE values of the perceptions of facilities and disturbances in the park (Table 3) and for the variables enjoying nature and social use (Table 4) are somewhat low.

The results of the structural model of the SEM analysis can be seen in Table 5 and Figure 4. It shows the relationships between the various constructs in the model. Only the significant relations are kept in this model (t-statistic > 1.96) to derive a parsimonious model. In Figure 4, the positive relationships are shown with an arrow and the negative relations are shown with a dashed arrow. Moreover, the latent variables are shown in ovals and the observed variables in rectangles.

Table 5. SEM results—standardized coefficients.

To	Number of Visits		Activity: Enjoying Nature		Activity: Social Use		Sense of Place		Satisfaction with Life	
	Direct	Total	Direct	Total	Direct	Total	Direct	Total	Direct	Total
Endogenous variables										
Nr. of visits							0.16	0.16		0.02
t-statistic							4.62	4.62		2.57
Enjoy nature							0.28	0.28		0.04

t-statistic							6.18	6.18	2.76
Social use							0.28	0.28	0.04
t-statistic							5.98	5.98	2.74
Sense of Place									0.13
t-statistic									3.05
<hr/>									
Park characteristics									
Nature			0.16	0.16			0.12	0.16	0.02
t-statistic			2.78	2.78			2.22	3.02	2.16
Facilities							0.29	0.29	0.04
t-statistic							5.29	5.29	2.67
Disturbances	0.10	0.10	0.13	0.13	0.12	0.12		0.09	0.01
t-statistic	2.16	2.16	2.29	2.29	2.40	2.40		3.59	2.34
Distance to park	-0.17	-0.17	-0.09	-0.09				-0.05	-0.01
t-statistic	4.17	4.17	1.99	1.99				3.34	2.27
Park size			0.13	0.13			0.15	0.19	0.03
t-statistic			2.80	2.80			4.23	5.11	2.64
Playgrounds					0.14	0.14		0.04	0.01
t-statistic					3.16	3.16		2.93	2.13
<hr/>									
Personal characteristics									
Age			0.20	0.20	-0.41	-0.41		-0.06	0.14
t-statistic			3.85	3.85	7.65	7.65		2.34	3.32
Single person									-0.13
t-statistic									3.05
Children					0.13	0.13		0.03	0.00
t-statistic					2.72	2.72		2.57	1.98
High education	-0.12	-0.12						-0.02	0.14
t-statistic	2.93	2.93						2.48	3.23
Medium income					0.22	0.22		0.06	0.01
t-statistic					4.69	4.69		4.03	2.45
High income									0.12
t-statistic									2.77
Disability									-0.21
t-statistic									4.92
<hr/>									
R2	0.05		0.14		0.26		0.44		0.14
R2 reduced form	0.05		0.14		0.26		0.28		0.12

The analysis showed that three of the park characteristics, namely park size, the appreciation of nature, and appreciation of facilities, are positively related to the sense of place. Based on the coefficients, it can be concluded that the appreciation of facilities influences sense of place the most. Moreover, significant relationships were found between sense of place and park use behavior. Park use behavior can be divided into three variables, namely number of visits, enjoying nature, and social use. The number of visits was found to be positively related to the sense of place. Sense of place was also found to be positively related to the activities connected to enjoying nature and social use. Based on the coefficients, enjoying nature and social use were found to have more of an impact on sense of place than the number of visits. No direct effects were observed between sense of place and personal characteristics. However, several indirect effects were found, via park use behavior.

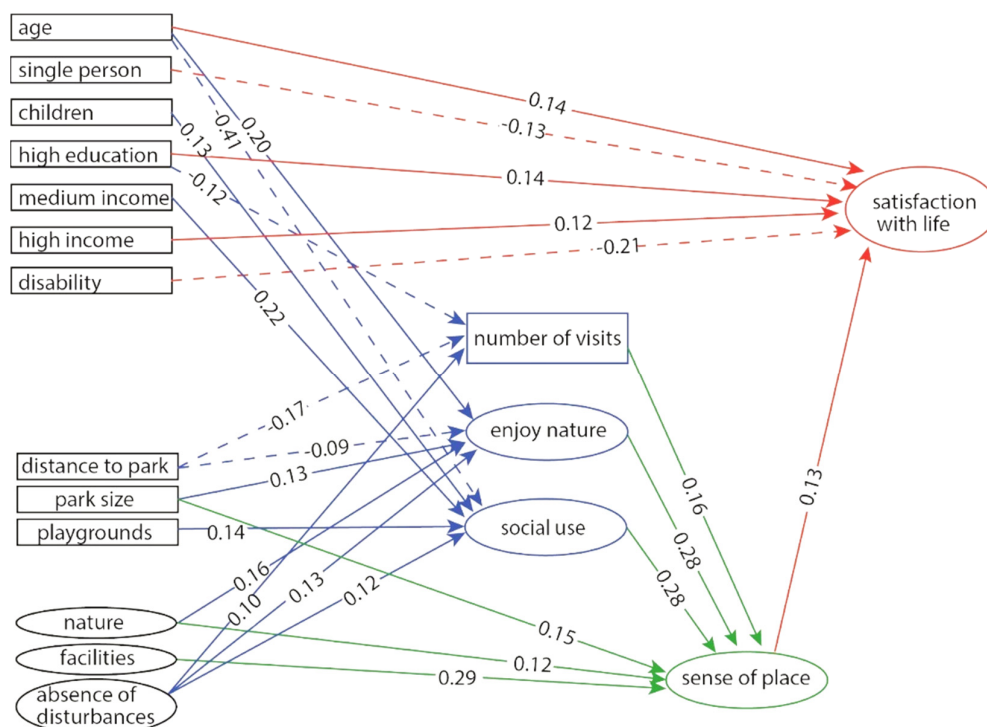


Figure 4. Final SEM model showing the significant relationships (positive relationships are shown with a solid arrow and negative relations with a dashed arrow) (the latent variables are shown in ovals and the observed variables in rectangles).

Looking at the variable “number of visits”, increasing distance to a park from a respondent’s house was found to have a negative direct relation with the number of park visits. This indicates that a park further away from home is less likely to be frequented. A higher education was also found to have a negative relation with the number of visits. Moreover, absence of disturbances was found to have a positive relation with the increasing number of part visits.

Regarding the park use behavior variable, “enjoying nature”, the increasing age of a person was found to be positively related, indicating that older people are more likely to visit a park for this type of activity. Moreover, the results show a positive relationship between park size and enjoying nature. As can be expected, the appreciation of nature and the absence of disturbances were found to have a positive relation with the variable “enjoying nature”.

“Social use” was found to be negatively related to the increasing age of a person. Furthermore, a significant positive relationship was found between social use and couples with children, as well as between social use and number of playgrounds in the visited park. Medium income is positively associated with the social use of the park. The absence of disturbance was found to have a positive relation with the social use activity as well, such as enjoying nature and the number of visits.

Satisfaction with life was found to be related to several personal characteristics. A direct positive relationship was observed between satisfaction with life and the personal characteristics increasing age, high education, and high income. Being single was found to have a direct negative relation with satisfaction with life. Another direct negative effect was found between satisfaction with life and having a disability. Furthermore, sense of place was found to have a direct positive effect on satisfaction of life. Park use behavior was not found to be directly connected to satisfaction with life, although there is a clear positive connection through the sense of place.

5. Discussion

In this section, the results are discussed further and compared to findings in literature. The main subjects are sense of place, park use, and satisfaction with life.

5.1. Sense of Place

Although the relation between sense of place and park characteristics was not measured by the earlier literature, several studies have indicated empirical findings on people's preferences for most of the park characteristics which are observed in this current study. For example, Nordh et al. (2011) [59] found that people prefer vegetation in a park, and Sanesi and Chiarello (2006) [60] found that people prefer to have certain facilities, such as paths and benches, in a park, and that these characteristics have an impact on the perception of parks. If a park has more green or facilities in it, people will probably prefer that park over another and thereby increase their sense of place.

Moreover, relationships surfaced between sense of place and park use behavior. Similar to the study of Farnum et al. (2005) [43], it is observed in the present study that the increasing number of park visits is positively related to the sense of place. This relationship indicates that people who visit a park more frequently tend to also create a better connection to that park. Moreover, sense of place was also found to be significantly and positively related to the activities connected to enjoying nature and social use. The latter two activities have more of an impact on sense of place than the number of park visits. In the present study, personal characteristics only seem to have an indirect effect on sense of place via park use behavior.

5.2. Park Use

For park use behavior, we examined the number of visits and the activities related to enjoying nature and to social use. The finding that the distance to a park has a negative relation to the number of visits indicates that a park further away from home is less likely to be visited. This finding is in line with the study of Tu et al. (2020) [61]. A higher education level was also found to be negatively related to the number of visits. This finding is also in alignment with Bjerke et al. (2006) [53], who found that people with a higher education level prefer green areas, but like them to be more natural or with dense vegetation. As a result, instead of an urban park, people with a higher education level are more likely to visit nature parks [53].

Our results showed also a negative relationship between the distance to the park and enjoying nature; thus, when a park is further away, it is also less likely that people go there to enjoy nature. However, our findings showed a positive relationship between park size and enjoying nature, which could indicate that more space might give more opportunity for enjoying the nature.

The results also show that increasing age is negatively related to social use and is positively related to enjoying nature. Thus, it seems older people are less likely to visit a park to meet other people, but more likely to visit a park to enjoy nature. This finding is also in line with the findings of Onose et al., 2020 [62].

Positive relationships were found between social use and couples with children, and between social use and playgrounds. The results also indicate that people with children and people who appreciate the number of playgrounds in parks tend to conduct more social use activities at the park.

Looking at the relationship between park use behavior and park characteristics, it is not surprising that the appreciation of nature is positively related to enjoying nature. The study by Mayer et al. (2009) [63] indicated that the positive effects of exposure to nature (such as positive emotions) are partially mediated by an increase in connectedness with nature. Furthermore, it can be concluded that park use is positively influenced mostly by the absence of disturbances (i.e., noise, odor).

5.3. Satisfaction with Life (as an Indicator of Long-Term Subjective Well-Being)

Long-term subjective well-being, measured with the satisfaction with life scale, was shown to be related to several personal characteristics. Our findings show a positive relation between satisfaction with life and increasing age. Satisfaction with life and a high education level show a positive relationship as well. The same relationship was found in the study of Baker et al. (2011) [64]. Although Baker et al. (2011) used objective measures of well-being such as mortality rate, they also showed that people with a higher education are expected to have a better well-being compared to people with a lower education level.

Our results, similar to the findings of earlier studies, showed that sense of place is positively related to satisfaction with life. Our model showed that sense of place also acts as an important mediator between park use, park size, and the appreciation of nature and facilities on one hand and satisfaction with life on the other. Findings from a study [65] of visitors in an Australian national park show that place attachment mediated the relationship between place satisfaction and reported quality of life. This finding might mean that people develop a sense of place based on their park use and appreciation and that this influences their satisfaction with life.

Regarding personal characteristics, we found a direct relationship between satisfaction with life and disabilities. This is a negative relationship that is not surprising and has been confirmed in other research studies (e.g., [66]). Household net incomes higher than EUR 50,000 per year was found to have a positive relationship with satisfaction with life. This finding is in line with the literature, where a higher income is often related to an improved subjective well-being (e.g., [67,68]).

The important finding of our study is that satisfaction with life is mainly influenced by personal characteristics and park use behavior, and that park characteristics and park facilities influence satisfaction with life via sense of place.

5.4. Limitations and Future Work

Although the results of this study give empirical insights into the use and sense of place of parks and their influence on subjective well-being, a number of limitations should be mentioned. Firstly, the study was executed in two medium-sized cities in The Netherlands. Therefore, the generalizability of our findings might be quite limited, as the results might differ for cities of a different population or in a different geographic area due to cultural and topological differences. For future research, data from other cities both from The Netherlands and other countries can be collected. The findings can be compared in order to understand the influence of the differences between the scales of cities (i.e., small, medium, large) and the cultural identities on the relation between urban park use, sense of place, and people's subjective well-being. In addition, as discussed in Section 4.1, the sample is not entirely representative of the population of the cities of Eindhoven and 's-Hertogenbosch, as it contained more elderly, highly educated, and Dutch participants, as well as couples without children. Future research is encouraged to use more representative samples and consider extending the population to a wider range of socio-environmental contexts.

In the current study, only a limited number of objective park characteristics was considered. For further research, it would be interesting to include other objective park characteristics as well. For instance, the percentage and type of vegetation in a park could explain the variable appreciation of vegetation. Moreover, the frequency of maintenance could be included in this study in order to understand the relation between the actual maintenance of a park and a park's appreciation. Adding more objective park characteristics would help local authorities to better understand how the actual situation of a park influences its perception.

Moreover, for further research, it might be interesting to investigate the momentary experiences at parks, rather than aggregated experiences captured in the concept of sense of place. Other studies (e.g., [34,35]) that have used an Experience Sampling Method

(ESM) found that experiences can differ due to weather, time of day, and people's momentary emotional state. Another method for measuring momentary experiences, Ecological Momentary Assessment (EMA), where participants are probed to answer short questionnaires multiple times per day, has been successfully used to examine the relation between daily exposure to nature and affective well-being [69] and has recently been combined with location tracking to examine people's experiences in natural environments in large-scale studies [70]. By comparing the data collected via ESM and/or EMA and a questionnaire related to the overall experience, a better understanding can be created regarding park experiences.

Finally, this research was conducted during the COVID-19 pandemic, and questions were asked for the park use behavior, sense of place, and well-being before the pandemic. Therefore, respondents had to recall their past experiences, which might have influenced their responses. Future studies are encouraged to collect participants' experiences in the appropriate context to avoid potential biases. Lastly, it would be beneficial to collect data on actual (rather than reported) park use behavior and combine this information with self-report data, particularly when examining momentary experiences at parks, as discussed earlier.

6. Conclusions

The aim of this research was to gain more empirical insights in the relationships between personal and park characteristics, park use behavior, sense of place, and park visitors' long-term subjective well-being (i.e., life satisfaction). Therefore, an online questionnaire was administered to participants in two medium-sized cities in The Netherlands, namely Eindhoven and 's-Hertogenbosch. Data were analyzed using a structural equation model (SEM). In the literature, it was argued that urban green parks can improve the well-being of individuals (e.g., [15,18,71]). In the current study, no direct relationships have been observed between the park characteristics, the use of parks, and the subjective well-being of individuals; rather, these relations were found to be indirect. The results from the structural equation model indicated that these relationships are mediated by sense of place. The model clearly showed that there is a positive relationship between sense of place and satisfaction with life. Moreover, park characteristics and park use behavior were shown to be directly related to sense of place.

Our results showed that the park characteristics are important predictors of sense of place and park use behavior. For sense of place, it was found that an appreciation of the park characteristics, park size, and an appreciation of nature have a positive relation with increasing sense of place. Moreover, an appreciation of the park characteristics was found to be the most important predictor of sense of place. Furthermore, our results showed that other park characteristics, such as the number of playgrounds, the park size, the distance to park, and the absence of disturbances, influenced the sense of place via park use behavior (frequency of park visits, social use, and enjoying nature).

These results show that in order to increase positive emotive bonds and attachments, and therefore subjective experiences with respect to urban green parks, the park facilities, park size, the absence of disturbances, and the appreciation of nature elements have great importance. Considering these findings, urban designers and policy-makers are encouraged to focus on these elements to optimize or design urban parks. For example, different types of vegetation can be added, which will also attract insects and birds and subsequently improve the biodiversity and natural sounds present in parks which have been found to increase the appreciation of nature in previous studies. In order to increase the appreciation of the absence of disturbances, policy-makers can take into account the traffic around parks and could make the roads surrounding the park less attractive for cars or make green sound barriers. Moreover, the distance to a park was found to be a predictor for the frequency of visits. Thus, local policy-makers should examine the distribution of parks in cities and optimize their distribution to make parks more accessible. It is also advisable to ensure safe and comfortable routes to parks that can make

the perceived distance smaller. In addition to that, park size was found to be a predictor of enjoying nature and sense of place. Therefore, it is important to make parks not only accessible, but also connected in cities where it is difficult to increase the size of parks.

This research contributed to the existing literature with new insights on the relationships between different aspects related to park use, sense of place, and the long-term subjective well-being of individuals. The relations between sense of place and park characteristics were not measured by the earlier literature. Moreover, the finding on the intermediary role of sense of place between urban park use, park characteristics, and long-term subjective well-being is a contribution to the existing literature. Although the results give insights into the use and experience of parks, there are limitations to this study, as mentioned in Section 5.4. These limitations demand more research into this topic by expanding the data collection to other cities and countries, including more objective park characteristics in the study, taking into account the momentary experiences at parks. These further directions for investigation would provide more understandings related to urban park experiences and their contribution to the subjective well-being of people.

While more research is necessary to explain several relationships, this study showed that the use of a park influences how that park is perceived. Importantly, the sense of place in a park was found to be positively related to the subjective well-being of park users (park users' life satisfaction). When urban parks are designed or optimized in a way that visitors feel more attached and connected to, this positively contributes to their long-term subjective well-being (i.e., satisfaction with their life). Therefore, the results of this study can be used to create parks that support a sense of place in The Netherlands and thus improve the long-term subjective well-being of their visitors.

Author Contributions: Formal analysis, P.v.d.B.; data collection, M.K.; writing—original draft preparation, M.v.D. and G.D.; writing—review and editing, P.v.d.B., A.B., K.C., M.K., M.W.-P. and E.v.L.; visualization, M.v.D.; funding acquisition, G.D., M.W.-P., A.B., P.v.d.B. and E.v.L. All authors have read and agreed to the published version of the manuscript.

Funding: This research was funded by the NWO VerDus Surf Pop Up program under grant number 438.19.170 and Actieagenda Ruimtelijk Ontwerp 2017–2020 of the Rijksoverheid of The Netherlands and The APC was funded by NWO VerDus Surf Pop Up program.

Institutional Review Board Statement: The study was approved by the Ethical Review Board of Eindhoven University of Technology (ERB2020BE22, 03-06-2020).

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: Data and the survey supporting reported results can be found on 4TU. ResearchData <https://doi.org/10.4121/14034821.v1> (accessed on 18 April 2022).

Conflicts of Interest: The authors declare no conflict of interest. The funders had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript, or in the decision to publish the results.

Appendix A. Statements Used in Questionnaire

Table A1. The Satisfaction with Life Scale (SWLS)—Likert scale ranging from 1 (disagree) to 7 (agree).

Items
In most ways my life is close to my ideal.
The conditions of my life are excellent.
I am satisfied with my life.
So far I have gotten the important things I want in life.
If I could live my life over, I would change almost nothing.

Table A2. Statements on park characteristics—Likert scale ranging from 1 (disagree) to 7 (agree).

Natural elements in parks

The variety of vegetation (such as trees, bushes, flowers etc.) is good.

The trees and bushes are well arranged in this park.

There are enough trees in this park.

There are enough flowers in this park.

There are enough bushes in this park.

In this park, there are enough nature sounds present (e.g., from animals).

The vegetation in the park is well maintained.

There is enough water present in this park.

There is enough grass in this park.

The park is close enough to my home.

I can reach the park without any hinder on my route (e.g., no dangerous traffic situations).

The park is big enough to do the things I want to do.

Faciliatory elements in parks

This park has enough benches.

The quality of the facilities in this park is good.

This park has sufficient play facilities for children.

This park has sufficient opportunities to exercise.

The walking paths in the park are well paved.

This park has enough walking paths.

There is no nuisance from litter in this park.

There is no nuisance from vandalism in this park.

There is no nuisance from graffiti in this park.

In this park, other people do not disturb my visitation.

The facilities in the park are well maintained.

The park is well lit.

There is no odor nuisance in this park (such as from exhaust gasses or from waste).

There is no noise nuisance in this park (such as from traffic).

Table A3. Statements on sense of place—Likert scale ranging from 1 (disagree) to 7 (agree).

Place attachment

This park is one of my favorite urban parks.

I really miss this park when I am away for long

Place identity

This park reflects the type of person I am.

This park makes me feel like I can be myself.

This park says very much about me.

Place dependency

This park meets my needs better than any other park.

This park is a good place to do the things I enjoy most.

As far as I am concerned there are better parks than this park.

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