



## Research article

## Quality analysis and categorisation of public space

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## ARTICLE INFO

## Keywords:

Urban parks  
Perceived Environmental Quality  
Restorative capacity  
Space care and design  
Quality assessment of public spaces

## ABSTRACT

Public spaces are considered areas that promote users' physical and mental health. The role of these people in public spaces makes it necessary to evaluate such areas. In this study, 12 urban parks on the island of Tenerife were evaluated, combining the assessment of a trained observer and the perception of users, to analyse and categorise the environmental quality of the parks. The findings of this study conclude that users are good evaluators of public spaces; that the Public Space Characteristics Observation Questionnaire (PSCOQ) tool allows the classification of public spaces and that physical order is capable of predicting the environmental quality and the restorative capacity of spaces, as perceived by users. The PSCOQ observation tool makes it possible to detect the strengths and weaknesses of public spaces so they can be improved and adapted to the needs of users.

## 1. Introduction

The WHO has identified, through the European Healthy Cities Network, an urgent need for policies that address health and well-being concerns in cities. Some of the health risks for urban populations that are associated with the characteristics of the space include physical inactivity, pollution problems and social isolation, as well as segregation and poverty, which contribute to inequalities [1]. Urban development plays a crucial role in improving these issues, and the availability of elements for the evaluation of urban spaces is a key issue. In particular, with regard to the analysis of social relations in public spaces and the green characteristics of these spaces. Jennings & Bamkole [2] found that social interactions in urban green spaces favour the development of social cohesion and behaviours that improve mental health and well-being. Along these lines, the interest lies in identifying which characteristics of public spaces should be prioritised to encourage social and active use, hence the importance of evaluation tools. For example, in green spaces, it has been shown that the diversity of natural elements (bodies of water, density of vegetation, etc.) favours social interaction [3]. Likewise, Rivera et al. [4] found that the presence in parks of large adventure playgrounds, large things to climb and cafés, promoted social interaction in adolescents. Similarly, the quality of public spaces that have green areas, favours their use by older people and facilitates health-related activities such as walking [5]. Regarding the health benefits of green features in urban spaces, Thompson et al. [6] found a decrease in cortisol levels and self-reported stress when the percentage of green spaces in neighbourhoods was higher. Another benefit related to green spaces has been found in relation to respiratory health, which improved if vegetation structure was of high complexity, as such encouraging diversity with the presence of trees, shrubs and grasses is recommended [7]. A relationship has also

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<https://doi.org/10.1016/j.heliyon.2023.e13861>

Received 15 November 2022; Received in revised form 14 February 2023; Accepted 14 February 2023

Available online 23 February 2023

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been observed between the density of trees on streets and the likelihood of walking [8]. In addition, it also reduces the adverse effects of city living, e.g. reported road noise nuisance is lower where there is more residential greenery and tree cover [9].

As cities are managed by urban planning regulations, they provide ideal situations for improvement interventions, particularly regarding Public Open Spaces (POS). As such, POS are not only conceived as settings for public life but also contribute to the quality of life of urban residents [10,11].

The POS comprise those physical locations where public activities take place, and where people can congregate and linger. These are shared areas where patterns of use and behaviour are established, and freedom of action and access prevail [12,13]. According to the global assessment tool on the quality of public spaces, the evaluation of POS should consider issues such as accessibility, use, satisfaction of social needs, upkeep, design, appearance, comfort, safety, importance to the community, and how users of these spaces feel about them. Accordingly, Askari and Soltani [14] note that social factors (e.g., availability of activities, entertainment, opportunities for interaction) outweigh physical attributes in the success of a public space. This paper addresses the design decisions that can favour the use and continued presence of people in POS. Key decisions in this regard are the choice of spaces, environmental quality indicators and the type of evaluation.

The following lines discuss which spaces are considered POS, as well as which ones have been chosen for this study. Furthermore, the existing quality and evaluation indicators in the literature on spaces are outlined, and how the tool proposed in this study (Public Space Characteristics Observation Questionnaire, PSCOQ) attempts to standardise the criteria used based on other instruments.

### 1.1. POS selection

POS are physical places that are freely accessible and available to all people. The most commonly used classification [15] includes up to eleven types of spaces (parks, squares, memorials, markets, streets, playgrounds, community open spaces, greenways, indoor markets, found spaces and waterfronts). Depending on the approach taken by researchers, one type of space or another has been selected, for example, research on active lifestyles has mainly used parks or green spaces, while urban designers consider other types of areas such as beaches [16]. Regarding their role in cities, POS stand out as an important asset in local communities, because they influence people's social, physical and psychological well-being, as well as being an element related to social justice [12]. Along these same lines, POS fulfil an essential social function, given their character as an open-air space where different activities can be carried out (eating, sports, civic, cultural, political meetings, etc.). In addition, debates have been generated around the POS regarding the lifestyles, values or attitudes towards sustainability that they generate [17]. They also emerge as a factor influencing the liveability of neighbourhoods [18,19]. In this sense, when designing a POS, guidelines are used, such as the percentage of the area (how much land is reserved for this type of space) or the population rate [19]. The latter factor has led to a higher proportion of the research on public spaces being conducted in large or medium-sized cities.

Specifically, we focused on urban parks, given their importance in urban centres. On the one hand, they provide a meeting place for cultural, social and recreational activities. On the other hand, they fulfil aesthetic functions and provide contact with nature. These types of spaces and their use improve urban life and bring a series of benefits. For example, the use of urban parks has been linked to improved physical and mental health in children, with these spaces being considered a low-cost health intervention [20]. Moreover, they are the places most frequently linked to the practice of physical activity with the consequent physical and mental health benefits it produces [21–23]. In this regard, Bai et al. [24] argue that the subjective perception of parks can predict physical activity and health [25,26]. These perceptions may even be more significant than the objective characteristics of a park itself, as they are what guide users' decisions. Another benefit of parks is exposure to nature. Along these lines, the positive effects of natural environments on people's health and well-being have been extensively documented [27,28]. For example, the presence of vegetation favours psychological restoration [29–32], in addition to the reduction of pathologies such as stress, anxiety or depression [33–35] or the increase in life satisfaction [36].

The following section examines what aspects determine the quality of POS and what evaluation strategies have been used to assess this type of space.

### 1.2. Quality indicators and evaluation

Research concerning the evaluation of neighbourhoods highlights three dimensions: one focused on architectural and urbanistic features, another on socio-relational characteristics and a third one, focused on functional aspects, such as the services and facilities available [37,38]. Moreover, Novacek et al. [39] note the importance of considering morphological and social parameters when investigating the quality of urban environments. They further deduce that there is no fixed catalogue of indices to be considered, therefore the evaluation of POS must adapt to the context and take into account factors such as local culture or climate. This increases the difficulty of this type of study and reduces the possibility of comparing results.

Observational measures based on expert assessments have been proposed as tangible evidence of the characteristics of physical spaces in an attempt to integrate the different parameters mentioned above [40]. However, the challenge for this type of assessment is the reliability and validity of the instruments.

The instruments used for the evaluation of parks differ in format, the number of items used, the characteristics studied and the training required to use such tools. Joseph and Maddock [41] published a comparison between various instruments and emphasised the role of the person administering the tool, mentioning in all cases researchers and professionals in the field analysed, while excluding the assessment of members of the community.

In an attempt to unify the criteria used in other instruments, the Public Space Characteristics Observation Questionnaire (PSCOQ)

was developed, differentiating between the domains of *architectural quality*, *functional quality* and *contextual quality*, including some of the generative criteria proposed by Bonaiuto et al. [38], assessing spatial, human, functional and contextual aspects. The instrument also includes some indicators that have been identified in the literature as influential in the perception of discomfort and/or insecurity when using a public space, such as decay and degradation [42,43].

In particular, the PSCOQ evaluates three primary aspects, *architectural characteristics*, *functional characteristics* and *contextual characteristics*, coinciding with the three categories of the instrument. These are divided into 11 subcategories: *accessibility*, *views*, *areas*, *services*, *signage*, *safety*, *cleanliness*, *physical order*, *presence of sensorial elements*, *lighting* and *absence of noise*, based on observable indicators. The instrument thus makes it possible to categorise public spaces in terms of quality. Other instruments have focused on evaluating spaces to determine their influence on different variables such as physical activity [44–46], health benefits [47,48] or the access people have to them based on socio-economic variables [49,50]. Likewise, different observation tools exist in the literature for the evaluation of public spaces [43,48,51–53]. All of them have shown their usefulness in assessing these areas, however, the PSCOQ tool allows for categorising public spaces according to their *architectural*, *functional* and *contextual quality*.

Additionally, self-reported measures have been used to address the subjective view of users, and how it influences their preferences for one space over another [54,55]. The disadvantage of this type of measure, however, is that results might be affected by other factors such as demographic variables, the frequency of use of the POS, or the type of activities carried out in these spaces. In a study on how individual and contextual factors influence the perception of parks, Fontán-Vela et al. [49] indicate that the mere presence of these spaces does not guarantee the creation of healthy environments. Therefore, approaches that take subjectivity into account are justified.

Consequently, and following the approach suggested by Pérez-Tejera et al. [48], this study examines how congruent users' perceptions are compared to the perception of trained observers, combining both sources of information. This makes a double contribution, indicating certain criteria for the quality of public spaces and assessing the validity of these objective indicators according to the perception of users.

## 2. Methods

This study followed a predictive design [56], to determine the predictive capacity of the independent variables, in this case, the objective assessment done by the trained observer, on the dependent variables, which consisted of the evaluation made by users of the public spaces analysed. Specifically, an observer trained to use the Public Space Characteristics Observation Questionnaire (PSCOQ), assessed 18 urban parks in Tenerife. At the same time, a team of four experienced interviewers and a coordinator were in charge of collecting the data of the users of these spaces. Users had to answer the Perceived Environmental Quality questionnaire by Ríos-Rodríguez et al. [57] and the Restorative Capacity scale by Ruiz and Hernández [58] in online format.

### 2.1. Spaces included in the study

This study was carried out in Tenerife, Canary Islands, where the most populated city does not exceed 210000 inhabitants, so it contributes to analysing the effects of POS in smaller and less populated places. In particular, 18 urban parks located on the island of Tenerife (Canary Islands - Spain) were evaluated, of which 12 were included in the study (see Table 1). To be included in this study, a public space had to meet two conditions: 1) it had to be located in an urban area with a population of more than 3000 inhabitants, and 2) it had to have been assessed by at least five users who frequently visited the space at least twice a week, this included both weekday and weekend use. Fig. 1 shows some of the public spaces assessed.

### 2.2. Participants

A total of 155 users of 12 urban public spaces took part in this study. Participants were residents of the island of Tenerife (Canary Islands - Spain), with an average age of 41.7, ranging from 18 to 78 years. Table 2 shows the sociodemographic variables collected in this study.

**Table 1**  
Spaces included in the study.

Urban public space	Users (n)	Percentage
Space 1. Parque de Guadamajete (1)	28	18
Space 2. Parque Natural del Montillo (2)	20	12.9
Space 3. Parque San Benito (3)	18	11.6
Space 4. El Casco (4)	16	10.3
Space 5. Parque El Pinar (5)	15	9.7
Space 6. Parque El Quijote (6)	10	6.5
Space 7. Parque de la Granja (7)	10	6.5
Space 8. Parque Hoya Machado (8)	10	6.5
Space 9. Parque Punta Larga (9)	9	5.8
Space 10. Parque Los Dragos (10)	7	4.5
Space 11. Parque García Sanabria (11)	7	4.5
Space 12. Parque Primero de Mayo (12)	5	3.2
Total	155	100



Parque Primero de Mayo



Parque San Benito



Parque Punta Larga



Parque Natural del Montillo

Fig. 1. Photographs of some of the urban parks assessed.

Table 2

Frequency of participants' socio-demographic variables.

Sex	Women	56.1%
	Men	43.9%
Educational level	Primary education	11%
	Secondary education	33.5%
	Studying in university	9%
	Completed university studies	46.5%
Employment status	Student	10.3%
	Unemployed	15.5%
	Working	65.8%
Income level	Retired	8.4%
	<1000€	18.1%
	1001€ –1500€	25.8%
	1501€ –2000€	21.3%
	2001€-2500€	11.6%
	2501€-3000€	10.3%
Marital status	>3000€	12.9%
	Married or living with a partner	63.2%
	Never married or lived with a partner	23.9%
	Separated/divorced	9.7%
	Widowed	3.2%

### 2.3. Materials and instruments

For the objective assessment, the Public Space Characteristics Observation Questionnaire (PSCOQ) [59] was used. This instrument measures three general characteristics of public spaces: *architectural characteristics*, *functional characteristics* and *contextual characteristics*. In this study, each of these three general characteristics has been conceptualised as a category. The instrument consists of 100 items grouped into 11 subcategories: *accessibility*, *views and areas*, belonging to the *architectural characteristics* category; *services* and

**Table 3**  
Content of the PSCOQ instrument.

Category	Subcategory	Content	
Architectural Charact.	Accessibility	Open/closed area	Public service stop
		Private/restricted areas	Parking areas
		Stairs	Regulation, levelling and maintenance of the pavement
	Views	Access and transit for people with reduced mobility	Difficulty in walking
		Visually attractive for walking	Views-attractive
		Perspective-sensation of spaciousness (unobstructed view)	Enclose/isolated by natural features, buildings or a combination of both
Areas	Animals	Water	
	Children	Pergolas or trees providing sun protection	
	Sports	Sculptures	
	Gardens		
Functional Charact.	Services-resources	Public bathrooms	Public eating area
		Water fountains	Litter bins
	Signage	Food outlets	Benches and seats
		Nominative	Advertising
	Indicative	Notice board	
	Informative		
Contextual Charact.	Safety	Opening and closing times	Visibility to the outside or surrounding buildings
		Security personnel	Emergency vehicle access and parking
		Security cameras	
	Lighting	Areas with slippery surfaces	
		Lighting level at night	Maintenance of lighting elements
	Cleanliness	Dark areas	
		Papers	Use of alcohol, drugs, tobacco
	Physical order	Animal droppings	Condoms
		Dead animals	Strong smells (rubbish, urine, blood, etc.)
		Abandoned areas	Abandoned items
		Flooded areas	Vandalism
		Broken walls-barriers	Burnt elements
		Boarded-up or dilapidated buildings	Theft of vegetation
Vegetation growth over pavement		Graffiti	
Absence of noise	Own	External	
Presence of sensorial elements	Fragrant plants	Bird habitat	
	Colour variety in vegetation	Sound of moving water	

*signage*, corresponding to the *functional characteristics* category; and *safety*, *cleanliness*, *physical order*, *presence of sensorial elements*, *lighting* and *absence of noise*, belonging to the *contextual characteristics* category. The PSCOQ has shown an adequate intraclass correlation coefficient ( $ICC3 = 0.70$ ;  $F(17,3078) = 3.23$ ,  $p < .001$ ) in previous studies [59,60], therefore indicating the existence of consistency between the assessments made by various observers when using this questionnaire [61]. The instrument presents different response scales: a) Presence-Absence (YES-NO), to assess whether or not the feature is present in the public space being evaluated; b) Optimal-Good-Average-Very Poor, to assess the quality of the feature being evaluated; c) Adequate-Inadequate, to assess whether or not the feature being evaluated is appropriate in the public space being observed. The following table (Table 3) summarises the contents evaluated by the subcategories.

For the assessment carried out by users, the *Perceived Environmental Quality* questionnaire by Ríos-Rodríguez et al. [57] and the *Restorative Capacity* scale by Ruiz and Hernández [58], were used.

Specifically, three of the four subscales of the *Perceived Environmental Quality* questionnaire were used. This consisted of 17 items with a Likert-type response, ranging from one to five, with 1 being “Strongly disagree” and 5 being “Strongly agree”:

- *Design of space* subscale, consisting of seven items with an internal consistency of 0.72, measured with Cronbach’s alfa [57].
- *Care of space* subscale, consisting of six items with an internal consistency of 0.84 [57].
- *Presence of sensorial elements* subscale, consisting of four items with an internal consistency of 0.75 [57].

The *Restorative Capacity* scale [58]. This instrument is composed of five items with Likert-type responses ranging from one to five (1 “Strongly disagree” and 5 “Strongly agree”). It was used to assess the *Restorative Capacity* of parks and gardens and had an internal consistency of 0.82 [57].

Lastly, socio-demographic variables were collected, including information on the gender, level of education, employment status and marital status of users.

#### 2.4. Procedure

For the objective assessment, an observer trained to use the tool was recruited. The observer attended three training sessions aimed at explaining the conceptual basis for each of the PSCOQ items, as well as the different response scales included in the questionnaire. In

addition, during these sessions, the observer was told how to proceed before and during the assessment. Specifically, in order to carry out the observations, the first step was to walk around and explore the public space to be evaluated. Secondly, to select a spot to sit down that would allow them to see as much of the space to be assessed as possible and, finally, to complete the observation tool in approximately 20 min.

Using the Public Space Characteristics Observation Questionnaire (PSCOQ), the trained observer assessed 18 urban parks in Tenerife, of which 12 met the conditions for inclusion in this study.

The assessments made by users were carried out inside or in the vicinity of the public space to be evaluated. For this, a team of four experienced interviewers and a coordinator were hired to create an online version of the questionnaire using the Qualtrics platform, as well as collecting the data. The users of the public spaces were first informed of the objective of the study and the importance of their participation. The anonymity of the responses and the confidentiality of any information given was also guaranteed. The interviewer then read the different items to the participant and, based on their response, the interviewer marked their choice on the questionnaire (either in printed or digital format). To finish off, users were thanked for their collaboration and asked for their consent for the use of their answers for research purposes. The time to complete each survey ranged from approximately 20 to 40 min.

## 2.5. Data analysis

Data is available at <https://data.mendeley.com/datasets/mvxbcm3b8d/1>. Data processing was carried out using IBM SPSS Statistics software, version 21. First, the internal consistencies of the different scales used in the questionnaire were calculated. Second, the means were estimated for each of the variables. Third, based on the expert assessment, the overall objective quality of each of the spaces analysed was calculated, generating two groups (Adequate - Notable Quality and Improvable Quality). For this, the mean scores of the 11 subcategories were used to calculate the scores of these public spaces in terms of architectural, functional and contextual quality. The mean calculated from these three types of quality produces the overall score. Fourth, differences in perceived environmental quality and restorative capacity were calculated as a function of the overall environmental quality. Fifth, to test the predictive capacity of the objective assessment of urban parks on users' evaluation regarding quality, regression analyses were carried out.

## 3. Results

First, the overall reliability of the *perceived environmental quality* scale was calculated, as well as the reliability of its three separate subscales (design of space, care of space and presence of sensorial elements) and the reliability of the *restorative capacity* scale. The results are shown in Table 4.

While the *design of space* subscale had a reliability of 0.69, the entire *perceived environmental quality* scale had an internal consistency of 0.86. Therefore, it was considered appropriate to keep all three subscales.

Second, descriptive statistics were calculated for the eleven subcategories of the Public Space Characteristics Observation Questionnaire (PSCOQ), shown in Table 5.

Table 6 shows the scores reported by the trained observer for each of the public spaces assessed with each subcategory of the PSCOQ tool.

**Table 4**  
Internal consistency of the scales, as measured by Cronbach's alpha.

Scale	Cronbach's alpha
Perceived Environmental Quality Scale	.86
<i>Design of space</i>	.69
<i>Care of space</i>	.84
<i>Presence of sensorial elements</i>	.77
<i>Restorative Capacity Scale</i>	.78

**Table 5**  
Descriptive statistics of the subcategories of the scale (PSCOQ).

		□	SD
Architectural quality	Accessibility	6.07	1.09
	Views	4.8	2.48
	Areas	7.19	1.12
Functional quality	Services	5.17	1.34
	Signage	3.00	1.91
Contextual quality	Safety	4.90	1.64
	Cleanliness	5.00	2.61
	Physical order	6.33	2.46
	Presence of sensorial elements	3.13	3.56
	Lighting	3.88	3.05
	Absence of noise	5.63	2.41

**Table 6**

Observer's objective evaluation score for each space (out of 10).

Park	Acc.	Views	Areas	Serv.	Sign.	Safety	Clean.	Physic.	Sens.	Light.	Abs. N.
(1)	6.81	4.00	6.01	5.00	1.00	6.25	2.50	5.00	2.50	5.53	2.50
(2)	7.12	4.00	9.09	8.41	6.00	5.00	10.00	10.00	10.00	5.53	5.00
(3)	6.82	6.00	8.55	4.83	1.00	6.25	6.25	8.00	5.00	5.53	7.50
(4)	5.90	4.00	6.51	6.00	1.00	3.75	2.50	2.00	.00	1.10	7.50
(5)	6.51	4.00	6.62	5.50	4.00	5.00	8.75	6.00	.00	5.53	5.00
(6)	5.45	10.00	7.11	3.50	4.00	5.00	2.50	3.00	2.50	.00	5.00
(7)	7.42	6.00	8.25	5.83	4.00	6.25	3.75	6.00	2.50	5.53	2.50
(8)	4.55	2.00	6.51	5.50	4.00	6.25	3.75	7.00	.00	2.20	7.50
(9)	5.00	2.00	5.49	3.00	2.00	2.50	2.50	5.00	.00	.00	10.00
(10)	4.39	2.00	6.54	4.83	1.00	6.25	5.00	6.00	2.50	8.87	5.00
(11)	7.42	6.00	8.33	4.66	6.00	5.00	7.50	8.00	10.00	6.67	7.50
(12)	5.45	8.00	7.26	5.00	2.00	1.25	5.00	10.00	2.50	.00	2.50

**Note:** **Acc.:** Accessibility; **Serv.:** services; **Sign.:** signage; **Clean.:** cleanliness; **Physic.:** physical order; **Sens.:** presence of sensorial elements; **Light.:** lighting; **Abs. N.:** absence of noise.

(1) Parque de Guadamojete, (2) Parque Natural del Montillo, (3) Parque San Benito, (4) El Casco, (5) Parque El Pinar, (6) Parque El Quijote, (7) Parque de la Granja, (8) Parque Hoya Machado, (9) Parque Punta Larga, (10) Parque Los Dragos, (11), Parque García Sanabria, (12) Parque Primero de Mayo (12).

**Table 7**

Descriptive statistics of the subscales applied to users.

Scale	Subscale	□	SD
Perceived environmental quality	Care of space	3.57	.69
	Design of space	4.13	3.76
	Presence of sensorial elements	3.81	.70
Restorative capacity		4.05	.50

**Table 8**

Overall mean scores of the parks.

Group	Park	Total Quality
Adequate-Notable Quality	Natural El Montillo	7.18
	García Sanabria	6.67
	La Granja	5.52
	San Benito	5.49
	El Pinar	5.17
Improvable Quality	El Quijote	4.76
	Primero de Mayo	4.65
	Urb Deport Hoya Machado	4.52
	Los Dragos Estudia	4.28
	Guadamojete	4.22
	Polideportivo El Casco	3.93
	Punta Larga_Multiaventura	3.33

Furthermore, [Table 7](#) shows the descriptive statistics of the scales that users of the public spaces completed regarding the variables of *perceived environmental quality* (design of space, care of space and presence of sensorial elements) and *restorative capacity*.

Third, the overall objective quality score was determined for the 12 parks assessed. In particular, [Table 8](#) shows the overall objective quality for each of the spaces analysed, with a maximum possible score of 10 points. The 12 parks were then classified into two groups, the first with those parks that scored five points or higher were classified as "Parks with Adequate-Notable Quality"; the second, with those parks with scores of less than 5, classified as "Parks with Improvable Quality".

Fourth, we tested whether there were differences between the two groups on how users assessed the *perceived environmental quality* and *restorative capacity*. The results showed differences between the groups, both in *restorative capacity* ( $F(1,153) = 5,50$ ;  $p < .05$ ), and in two of the three subscales composing the *perceived environmental quality*. Specifically, differences were observed in *design of space* ( $F(1,153) = 8,72$ ;  $p < .01$ ) and *care of space* ( $F(1,153) = 8,56$ ;  $p < .01$ ), while no differences were observed in the *presence of sensorial elements* subscale.

Finally, in fifth place, four regression analyses were carried out to test the predictive capacity that the 11 subcategories used by the trained observer had on users' assessment of the *perceived environmental quality* (*care of space*, *design of space* and *presence of sensorial elements*) of the public space and its *restorative capacity*. Significant regression models were obtained for three of the variables analysed (see [Table 9](#)), except for the presence of sensorial elements.

Results showed that the variable capable of predicting users' assessment of public spaces was *physical order*. Specifically, this subcategory of the Public Space Characteristics Observation Questionnaire (PSCOQ) predicts users' assessment of the *design of the*

**Table 9**  
Regression models.

	R	Adjusted R <sup>2</sup>	F	fd	β
Care of space	.75	.52	13.03**	1,10	.75**
Design of space	.73	.48	11.08**	1,10	.73**
Restorative capacity	.72	.48	11.04**	1,10	.73***

\*\*p < .01; \*\*\*p < .001.

space, care of space and restorative capacity of urban parks.

The variable *physical order* explained 52% of the variance of *care of space*, 48% of *design of space* and 48% of *restorative capacity*.

#### 4. Discussion

This study aims to test the consistency between users' perception of public spaces, and that of the trained observer, following the suggestions of previous studies [52]. This study has made it possible to analyse public spaces, finding certain quality criteria, which were then linked to the perception of users.

By using the PSCOQ tool, we were able to group public spaces into two categories: "Parks with Adequate-Notable Quality" and "Parks with Improvable Quality", depending on the overall objective quality score obtained. The data generated by the tool allows for the comparison of green spaces, an important step in their evaluation and subsequent improvement. Unlike other scales [43,48,51–53] the PSCOQ tool facilitates the management of public spaces, using the different specific scores obtained for each subcategory of the scale can guide professionals on which elements should be improved in the first place.

The PSCOQ tool exhibits predictive validity, through the subcategory *physical order*, it was able to predict users' scores on *care* and *design of space*, in terms of *perceived environmental quality* and *restorative capacity*. Specifically, evidence of deterioration, abandoned elements or signs of vandalism, determined users' perceptions of *care of space* (maintenance and cleanliness), *design of space* (understood as the appropriate arrangement of elements and areas of space) and *restorative capacity*. Thus, the results of this work indicate that a fundamental element in the perception of users on the *quality* and *restorative capacity* of these spaces is that they present *physical order* (the absence of abandoned areas, flooded areas, broken walls or barriers, boarded up or dilapidated buildings, vegetation growth over the pavement, abandoned items, signs of vandalism, burnt elements, theft of vegetation and graffiti). These findings are in line with research done by Andrade et al. [62] in hospital environments. The authors found that the physical environment seemed unable to improve users' satisfaction with the space when its quality was high, however, it could reduce satisfaction with the space if the quality was low. In other words, when the physical environment is good it does not improve well-being but reduces it when it is inadequate.

The *physical order* variable of the PSCOQ tool includes, as previously mentioned, indicators of deterioration, lack of maintenance, abandoned elements, or signs of vandalism. Along with these indicators, urban disorder and architectural degradation are some of the elements noted by Mazza [42] that cause urban spaces to be perceived as unsafe, regarding not only crime but also concerning risk, fear and the discomfort associated with these places. The author argues that in the field of urban prevention, anything that generates insecurity in public spaces and causes the occupants to modify their daily activities must be identified. Along these lines, Valera et al. [43] point out the effect that factors related to the care of spaces (vandalism, inadequate lighting or the presence of rubbish, for example) have on perceptions of insecurity and the consequent reduction in the use of parks and squares, concluding that keeping parks in optimal conditions invites the use of these spaces, favouring a more democratic use and the enjoyment of more restorative experiences.

This study is not without limitations. The first one is that only one trained observer was involved in the assessment, so it was not possible to determine the interjudge reliability of the PSCOQ, although the tool has shown an adequate intraclass correlation coefficient in previous studies [59,60]. Despite this, future research should incorporate the assessment of more than one trained observer. The second limitation is that only one type of space has been included, parks, as such, research should be extended to include other types of public spaces (squares and gardens). Moreover, this would allow comparison between public spaces of different sizes and dimensions, as well as provide further evidence on the reliability and predictive validity of the proposed observational tool. The third limitation is that this research was carried out in an island setting with an urban layout that is not extensive, and therefore the results obtained must be taken with a certain degree of caution when generalising them, especially in large cities and metropolises. However, the limited number of studies carried out on small cities emphasise the results of this work, since 12 parks were included, located in urban centres with populations ranging from 9000 to 210000 residents, allowing us to better understand the reality of these spaces by analysing their main strengths and weaknesses, as well as the needs perceived by the people who use them.

This work aims to align with one of the Sustainable Development Goals, the end of poverty, which includes the challenge of access to and control of natural resources for all [63]. Social changes such as declining household purchasing power can lead to difficulties in accessing nature. As McCunn [64] highlights, maintaining access to parks or natural features on a small scale may not be an option for everyone, given distances, types of housing or opportunities to view nature. For example, it is not always feasible for groups such as the elderly who might have limited mobility. In the case of children, evidence indicates that residential proximity to green spaces and recreational areas contributes to a lower prevalence of developmental psychological disorders. Specifically, the authors note the role of green spaces in areas of low socio-economic status as a protective factor for children's mental health [65]. Thus, research and intervention in public spaces favour social equity in meeting the needs of diverse social groups. Further research in this area taking into account individual variables, such as gender or age, would also be useful as they can influence the use of spaces [66].



## 5. Conclusions

The aim of this study has been to verify how congruent users' perceptions are compared to the perception of trained observers. This has allowed us to identify certain criteria for the quality of public spaces and assess the validity of these objective indicators according to the perception of users.

To sum up, this study provides insight into the analysis and categorisation of public spaces according to their environmental quality. As a consequence, we can identify which elements of the parks analysed are adequate and which could be improved, as well as establish their level of quality in order to propose improvements that respond to the real needs of the people who use them. In this direction, our work contributes to research on the assessment of the quality of public spaces. Specifically, our PSCOQ tool allows us to compare public spaces, classify them and implement the necessary interventions to improve them. Moreover, this study highlights the congruence between the assessment made by a trained observer and the users of public spaces. Previous studies have shown the objectivity of users when evaluating the spaces with which they interact. That is to say, a high degree of coincidence has been observed between the assessments made by laypeople and professionals from different disciplines. Thus, our results indicate that users of public spaces are efficient evaluators of their environment and, therefore, should be taken into account when assessing these areas. Finally, our results show that physical order plays an important role in users' perception of the care and design of space and the restorative capacity provided. Intervening on this variable seems, at first a simple task, as it involves keeping the elements of the public space in good condition (clean, orderly). As such, a small or inexpensive intervention can optimise the quality and restorative capacity of public spaces. Hence, the analysis of the security, or physical order, of urban spaces should be taken as a starting point for any intervention that seeks to improve the perception of users about care and design of public space, as well as the perceived restorative capacity.

## Ethics statement

Users were first informed about the objectives of the study. They were then told that their personal data and any information provided during the study would be stored securely and treated with confidentiality, following data protection regulations. Finally, users were asked for their consent to participate in the study and were informed that they could stop participating at any point in time if they wished to do so. No underage participants were involved in this study and there was no risk to users. After completing the questionnaire, users gave their written consent. The procedure followed in the study complied with the principles of the Declaration of Helsinki for research involving human subjects.

## Acknowledgments

This research received financial support from the CajaCanarias Foundation for the project: 2017REC32-Protocolo conductual de recuperación de plazas y jardines.

## Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.heliyon.2023.e13861>.

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