

# Uses, attitudes and perceptions of urban green spaces according to the sociodemographic profile: An exploratory analysis in Spain

Paloma Egea-Cariñanos<sup>a</sup>, Pedro Calaza-Martínez<sup>b</sup>, Daniel López Roche<sup>c</sup>, Paloma Cariñanos<sup>d,e,\*</sup>

<sup>a</sup> Department of Political Science, University of Granada, 18071 Granada, Spain

<sup>b</sup> Spanish Association of Public Parks and Gardens (AEPJP), Higher Technical School of Mountains, Forestry and Natural Environment Engineering, Polytechnic University of Madrid, 28040 Madrid, Spain

<sup>c</sup> Complutense Institute of Sociology for the Study of Contemporary Social Transformations (TRANSOC), Complutense University of Madrid, 28015 Madrid

<sup>d</sup> Department of Botany, University of Granada, 18071 Granada, Spain

<sup>e</sup> Andalusian Institute for Earth System Research (IISTA-CEAMA), University of Granada, 18071 Granada, Spain

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## ABSTRACT

This exploratory work analyzes the uses and attitudes of a sample of Spanish population towards urban green spaces (UGS), through a questionnaire that reviews aspects such as the perception they have before and during the Covid-19 pandemic. The identification of profiles related to fear in UGS at night and the degree of user acceptance regarding services and disservices of these spaces will also be analyzed. Results show that the pandemic had a significant impact on the type of UGS visited and the activities carried out in them, due to the strict measures adopted by the government to manage the crisis, which included the closure of UGS. The segmentation analysis developed to assess the socio-demographic profile of fear revealed that women under 40 years old are the most highly likely to be afraid due to darkness, loneliness or insecurity. Regarding the degree of acceptance, the confirmatory-factor analysis established different clusters according to the favorability towards UGS, rejection of the disservices caused by trees and intensity of the demand for the administration to carry out its functions. This analysis provides relevant information to be attended when rethinking and redesigning urban green spaces so that they accommodate the real needs of the population.

## 1. Introduction

The restrictions on the use of public spaces during the COVID-19 pandemic have been one of the measures that have had the greatest impact on the daily life of citizens in recent decades (Giuntella et al., 2021; Hettiarachchi et al., 2022). The quarantine periods established by the governments of different countries have limited to different degrees the possibilities of accessing urban green spaces (UGS) and enjoying their benefits at times when it was so necessary (Honey-Rosés et al., 2021). With the argument that prohibiting the use of public space was a key measure to reduce the transmission of COVID-19, the consequences and other more lasting health impacts that these measures caused collaterally in the health of the population were not calibrated (Davies & Sanesi, 2022; Maury-Mora et al., 2022). Numerous studies have revealed the significant impact on physical and mental health that lockdown had on different social sectors of the population, mainly on the most

vulnerable (Noszczyk et al., 2022; Simon et al., 2021). Perceived stress, depressive symptoms, mood disturbance and memory have been some of the most frequently reported impacts on adults over 70 years of age, with aggravated symptoms during the pandemic, and extended symptoms after it (Docherly et al., 2021). In a systematic review carried out on the impact of the COVID-19 lockdown on children and adolescents, with data from 35 different countries, a reduction in physical activity, an increase of up to >6 h a day in screen time and an alteration of hours and quality of sleep were featured as the most prominent impacts (Kharel et al., 2022). The group of people with disabilities has been one of the most affected by the isolation measures associated with the COVID-19 pandemic, due to factors such as the lack of guarantees of access to essential goods and services, including health services, the lack of support from family members and administrations, the alteration of their daily routines or the cancellation of their treatments and rehabilitation sessions (Shakespeare et al., 2021). Regarding the group of women, the

\* Corresponding author at: Dept. of Botany, University of Granada, Campus de Cartuja, E-18071 Granada, Spain.

E-mail addresses: [palomaegeac@ugr.es](mailto:palomaegeac@ugr.es) (P. Egea-Cariñanos), [calaza@iies.es](mailto:calaza@iies.es) (P. Calaza-Martínez), [danlop06@ucm.es](mailto:danlop06@ucm.es) (D. López Roche), [palomacg@ugr.es](mailto:palomacg@ugr.es) (P. Cariñanos).

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circumstances derived from the confinement increased the risk factors for all types of violence, domestic violence and intimate partner violence, due to tensions in the domestic sphere, economic burden, limited access to support services, but above all, to the increase in risk factors of the perpetrator as it has been highlighted in several worldwide studies (Agustí et al., 2022; Kourti et al., 2023; Piquero et al., 2021; Usta et al., 2021).

In this dystopian environment, UGS took on an even more important role than the one they already had, since in the cases in which the restriction measures allowed it, they became restorative and relaxation places, in which the population found relief in the face of an unprecedented situation hitherto for the majority (Honey-Rosés et al., 2021; Kleinschroth & Kowarik, 2020; Ugolini et al., 2020). For the population of countries with stricter confinement measures, not being able to visit green spaces and carry out activities in them was one of the daily routines that citizens missed the most, not only because that meant being able to go outside, but also for all the well-being and benefit that they can find in moments of such need as those that were being experienced (Kolimenakis et al., 2022; Venter et al., 2020; Xie et al., 2020). This has been highlighted in the numerous works that have published surveys on the changes in the perception of users of urban green spaces before and during the COVID-19 pandemic. One of the first studies carried out analyzed the effect of COVID-19 on the use and perception of urban green spaces in five European countries (Croatia, Italy, Slovenia, Lithuania and Spain) and in Israel, found changes not only in the activities that were carried out among the users of green areas before it, but also in the distance traveled to reach these areas, the mode of transport and, above all, the activities that were carried out in them (Ugolini et al., 2020).

A more particular analysis on perceptions and behavioral patterns related to UGS in municipal areas defined by the Italian government as red zones, mainly in the northern region, with others considered as non-red zones, showed a significant change in habits. While in the areas of highest risk (red zones) the main activities carried out during the lockdown were those considered essential (for example, walking the dog), in the remaining areas the motivations for visiting the UGS were more related to physical exercise (Ugolini et al., 2021). In Croatia, an exploratory study on the perception and attitudes of residents about green spaces, found no differences in the attitude towards the benefits of green spaces between respondents from small settlements and large settlements, but did find differences regarding the management of green spaces and some disservices such as the increase in housing costs in the vicinity of green areas and the risk to people of trees along roads (Marin et al., 2021). At the national level, a study in Greece can also be highlighted, which evaluated citizens' perceptions of the role of green areas and their willingness to accept an increase in their municipal taxes for improving the services offered by these spaces (Kolimenakis et al., 2022). An explorative approach to examine changes in attitude towards urban green spaces carried out in Belgium, highlighted that most of the respondents had increased the value attributed to UGS during the COVID-19 pandemic, but that this increase differs between sociodemographic profiles such as age, gender, care responsibilities and access to public green spaces (da Schio et al., 2021).

At the local level, respondents to a survey on the perception and use of UGS in New York during the COVID-19 pandemic highlighted some concerns (for example "too crowded" or "people are not practicing social distancing"), and characteristics of UGS that people considered important, and that varied across gender, race and ethnicity (López et al., 2021). In Oslo (Norway), where the lockdown was less severe, outdoor recreational activities, both pedestrian (walking, running, hiking) and cycling activities increased by 291 %, in relation to the activities that were carried out before the pandemic (Venter et al., 2020). In a survey of 386 residents in Chengdu (China), the results indicated that the majority preferred to visit parks located <10 min from their homes, for a stay of between 31 min and 1 h, preferably during the afternoon and evening, and with a frequency of 1 day a week, all of the above being a pattern

totally different from that of the pre-pandemic situation, but which allowed many of the residents to maintain their mental health status without significant changes in relation to their previous status (Xie et al., 2020). A study that investigated the impact on urban green spaces management, identified the needs of the residents regarding UGS equipment and assessed UGS accessibility in Krakow, highlighted that 96 % of residents had access to a green area within 300 m of their residence, and that 79.3 % of them continued visiting them during the pandemic. Regarding equipment, additional rubbish bins, more benches and light that can improve safety were the most requested (Gorzelay et al., 2022). Finally, in a study carried out in Madrid with the aim of understanding the relationship that people had with UGS prior to the COVID-19 pandemic and the new bond that had emerged, specifically the impact of stress levels, it was confirmed that people who were able to interact with open spaces somehow they handled stress levels better than people who couldn't visit them (Maury-Mora et al., 2022).

Regarding the socio-demographic profile of the participants in these studies, some basic variables such as gender, age, educational level, professional activity and/or income, have been considered in the vast majority of the studies carried out (López et al., 2021; Marin et al., 2021; Ugolini et al., 2020 and 2021; Venter et al., 2020). However, some studies have included some other variables of interest. Thus, in a study carried out in the Chinese city of Xuzhou, the marital status of the person, the home ownership and the residential pattern were included among the demographic characteristics (Wang & Li, 2022). In Mexico City, the association between urban green spaces and subjective well-being (SWB) during the COVID-19 pandemic was evaluated, conditioning this SWB on gender, culture, age, socioeconomic status, marital status and location-specific characteristics that can influence an individual's quality of life (Huerta & Utormo, 2021). A study carried out in Brisbane (Australia) included languages spoken at home, household with backyards, house with school-aged children and a characteristic called Nature-relatedness score, which measures the subjective sense of connection people have with the natural environment, as additional socio-demographic characteristics to the basic ones (Berdejo-Espínola et al., 2021; Nisbet et al., 2009). Several studies have also highlighted changes in the use and perception of UGS from a gender perspective, especially in relation to the feeling of security that women have in these green spaces. To the traditional perception of insecurity in UGS that many women recognize, such as the anxiety that walking alone at night through poorly lit parks can generate and their own consideration as a vulnerable person (Condon et al., 2007; Gargiulo et al., 2020; Polko & Kimic, 2022), the barriers that affected both physical and mental access to UGS during the pandemic were added (Mayen Huerta & Utormo, 2022).

Spain was one of the countries in the world with the strictest confinement, since during a period of 166 days in 2020, the population had limitations almost entirely to carry out activities of their daily life, work, economic, but above all social (Martínez-García et al., 2022). In Spain, the closure of urban green areas to carry out any activity was included in the first measures adopted by the Government after the declaration of the state of alarm for the management of the health crisis caused by COVID-19 (Law 3692, Official State Gazette (BOE) no. 67). During the following extensions of the state of alarm, the closure of parks and gardens was maintained, but in Order SND / 370/2020 of April 25, the so-called "authorized green areas" were included, that is, those spaces considered to be in compliance with the social distancing requirements, and which are within a radius of 1 km of maximum distance from their homes. The practice of sports practices and access to playgrounds located in green areas was expressly prohibited. The Order of the Ministry of Health SND / 380/2020, of the BOE n° 121 of May 1 left the responsibility for opening or not the green areas in the hands of local entities. This generated very uneven situations in the main cities of the country, because while in some all or most of the parks were open to the population, as was the case in Seville and Barcelona, in others some streets and avenues were made pedestrian to avoid the formation of

crowds. Finally, some cities like Madrid, Toledo or Granada kept the parks closed much longer because they were hit hard by the COVID-19 pandemic.

All these exposed situations highlight the importance of knowing the opinion about the uses and perception of the users of the UGS for improved urban planning and to continue reinforcing the role of the UGS as places to maintain a favorable quality of life for urban citizens. In the case of Spain, knowing this information may be even more relevant due to both the idiosyncrasy of the country itself, in socioeconomic and biogeographical terms, and the different situations that could have been generated due to an unequal application of the regulations for the use of urban green areas during the pandemic. This is one of the main novelties of this study, which has as its general objective to analyze the uses, attitudes and feelings of the sample of the Spanish population towards green spaces and what perception they have of them before and during the confinement forced by the COVID-19 pandemic. Since this study will use an extensive questionnaire that will review different aspects related to urban green spaces, it will be also possible to continue advancing knowledge through research questions such as: i) What changes did the COVID-19 pandemic demonstrate in the frequency and type of use of urban green spaces?; ii) Which socio-demographic profiles are more likely to feel insecure or afraid in urban green spaces at night?; and iii) what degree of acceptance do users of Spanish green spaces have regarding the services and disservices that these spaces provide?, could be addressed. To the best of the authors' knowledge, these issues have not been jointly or globally analyzed in previous studies. Therefore, these results will allow us to detect existing knowledge gaps and move towards urban green spaces that take into account the real needs of the population.

## 2. Methodology

### 2.1. Survey and data collection

Data for this research were collected through the distribution during 12 April to 4 May 2020 of an online Google Form questionnaire. The aim of the questionnaire was to study the uses, attitudes and feelings of the respondents towards UGS during the Covid 19 pandemic in Europe. The questionnaire was developed by researchers from the Institute of Bio-economics of the Italian National Research Council (CNR) and it was the instrument of a larger international exploratory study conducted simultaneously in Croatia, Israel, Italy, Lithuania, Slovenia and Spain (Marin et al., 2021; Ugolini et al., 2020; Ugolini et al., 2021). Prior to participating in the survey, respondents were asked about informed consent. Additionally, a link with information on the researchers conducting the survey, what data would be collected, how the data would be stored, analyzed and reported, and respondents' rights regarding the provided data was provided. Participation was voluntary and participants had the right to leave the questionnaire at any time. The questionnaire was divided into nine sections. These sections contained between 30 and 45 questions, depending on whether respondents self-identified as regular UGS visitors or non-visitors and whether or not they had visited UGS during the COVID-19 pandemic, and it took about 20 min to complete in its entirety (Ugolini et al., 2020, 2021).

The sections aforementioned were (see the whole questionnaire in Supplementary material):

- 1-Preliminary identification of the sample (filter question) in two categories: "users" and "non-users".
- 2-Defining the attitude of the subsample "users" in relation to the green areas.
- 3 and 4-Highlighting the effects of the isolation on the frequentation of green areas (to the extent allowed) in the two sub-samples "users" (Section 4) and "non-users" (Section 3).
- 5-Identifying the factors most missing during the isolation, in relation to green areas.

- 6-General perception of the importance of UGS and trees in urban areas.
- 7-Opinion on the management of a known UGS.
- 8-Awareness of terms and legislation on urban green areas management.
- 9-Characterization of the sample.

In this article we are going to focus mainly on the segmentation of socio-demographic profiles according to their response to the questions along the survey.

The first mailings were made through the authors' network of contacts, who in turn sent it to other contacts, both professional and personal, thus generating a sort of snowball effect. Finally, 681 responses were collected. Given that non-probabilistic sampling was used, we offer results that are valid for our sample and descriptive of Spanish society but not inferences or representativeness of the general Spanish feeling towards UGS. This study should be understood as an exploratory starting point for future research.

### 2.2. Operationalisation of variables

Since the survey included variables of different categorization: categorical, binary, frequential or numerical, it has been necessary to operationalize them in order to be able to treat the data in the subsequent analyses. The way in which each variable has been operationalised is given below.

1. Within the socio-demographic block, all variables have been recorded as categorical. Habitat (V1) contains three response categories, village or rural area, small town and large city. Despite being aware of the realities that survey measures of gender may fail to reflect the diversity of the population and the lack of fairness involved (Magliozzi et al., 2016; Spiel et al., 2019), in order to address some of the research questions of our article, in particular the issues related to fear and its motives, gender (V9.1) has been measured in binary terms. Given that the occupation of public space and its perceptions are different depending on gender, as demonstrated by previous studies (Agustí et al., 2022; Pérez, 2012), we consider this variable fundamental for our analysis. Age (V9.2), also, along with gender, with great explanatory power, has been operationalised into 4 response categories (under 40, 41–49, 50–59 and over 60) in order to classify ours into balanced groups that allow comparisons to be established; Employment (V9.3) into three categories (public or private employee, freelance, inactive population) and Educational level (V9.4) into three categories (compulsory education, university degree and postgraduate).
2. To compare the population's use of urban green spaces before and during the strict lockdown question Sections 2 and 3 were used. These refer to the distance to the green space visited (<200 m, between 200 and 500 m and >500 m), the means of transport used to get around (walking, car, bicycle, motorbike, public transport and others), the type of UGS (park, green space far from the city, riverbank or promenade, bush, forest, garden, tree-lined streets and squares), frequency of attendance (every day, more than once a week, several times a month, once a month and less than once a month), and the reason for attendance (walking the dog, relaxing, playing sport, observing nature, reading, playing with children and others).
3. The socio-demographic variables described above and those questions referring to fear and its motives (V5.9 and 5.10) were used to identify the profiles that mark the different perception of fear at night, by a segmentation analysis. The first of these has been recorded as a dummy (fear/not fear) and in the second the operationalised categories have been: nothing, darkness, loneliness, delinquency/insecurity and others.

4. Finally, with the intention of first developing a factor analysis and then constructing clusters, the multi-questions 5.4 and 5.5 were used. All of them are measured on a Likert scale with the lowest score being 1 (strongly disagree) and the highest score being 7 (strongly agree).

### 2.3. Statistical analysis

Once the survey results were cleaned and coded, the most appropriate statistical technique was developed for each specific purpose. Descriptive and explanatory techniques were combined. First, to compare the use of UGS provided by respondents before and during the COVID-19 pandemic, descriptive frequency analysis and cross-tabulations were used (López-Roldán & Fachelli, 2015).

In order to differentiate the occupation and perception of the sample towards the UGS according to their socio-demographic profile, a segmentation analysis was carried out. The intention of this analysis was: 1) to study the socio-demographic variables that condition the fact of feeling or not feeling fear in an Urban Green Space at night (Dependent) and 2) to analyze the profiles with a greater predisposition to feel this fear. The variable 5.9 In the nighttime, when alone in a park or garden you feel...? has been reconfigured into a dummy, taking the value 1 for people who did not feel fear and 0 for those who expressed fear in a UGS at night. Once the significant variables for the analysis were known, the socio-demographic profiles most likely to feel fear were drawn up using the segmentation analysis technique. To do this, the sample is fragmented following a sequential descending process with three levels of depth based on the proposed variables, using the CHAID segmentation method, recommended when the dependent variable is dichotomous (Perri & Van der Heijden, 2012).

Finally, to identify the population's assessment of the ecosystem services and disservices of the UGS, three factors were extracted from items 5.4 and 5.5, referring to the favorability towards green spaces, the assessment of the management of these spaces and the disservices of trees in streets and squares. For this purpose, a confirmatory factor analysis was carried out (Brown, 2015). Since variables measured on a Likert scale of 1 to 7 are used, polychoric correlations are used. In factor analysis, when the data are categorical, methods that assume that the data are continuous should not be used, particularly the covariance matrix, which includes this among its assumptions. The consequences of this may be that the correlation will depend on the amount of association between the observed variables and the observed response frequencies, leading to: 1) underestimation of the relationships between indicators (especially between items with different response frequencies), as well as of the weights of items with asymmetric response frequencies, 2) occurrence of pseudo-factors of difficulty or extremity or, in general, spurious factors, 3) incorrect statistical tests and poor estimates of standard errors and parameters (Asún et al., 2016; Brown, 2015). Therefore, we resort to polychoric correlations, in the case of >2 categories, or tetrachoric correlations, with dichotomous variables. Thus, the key issue in categorical data is that the matrix of polychoric or tetrachoric correlations should be used. This implies assuming that behind the category variables lie unobserved continuous variables that correspond to the former and that are estimated with these polychoric (>2 categories) or tetrachoric (2 categories) correlations. This serves to correct for the loss of information in the covariances due to the categorization of the assumed underlying continuous variable (Newsom, 2018). For the estimation of these poly/tetrachoric correlations, three steps are usually followed: 1) as it is assumed that continuous variables underlie the observed categorical variables or items, if the item has x number of categories, it involves defining thresholds for the continuous variable that is considered underlying from which the subject chooses one category or another of the item and there will be as many thresholds as the number of categories of the item minus one; therefore, these thresholds and the bivariate distribution of the continuous variables underlying the observed ones must be estimated. 2) From these

estimates, polychoric and tetrachoric correlations are obtained to reflect the association between the underlying continuous variables. 3) A factor model is used to minimize the differences between the matrix of polychoric and tetrachoric correlations and the matrix reproduced by the model. Compared to the use of classical factor analysis with covariances for categorical data for which it is not robust, the estimates are of much higher quality with polychorics and tetrachorics (Asún et al., 2016).

The data estimation method chosen, given possible breaches of the assumption of normality, is diagonalised weighted least squares (Brown, 2015; Flora & Curran, 2004). As fit indicators, Root mean square error of approximation (RMSEA) (a good fit being below 0.6), Comparative fit index (CFI), Tucker-Lewis Index (TLI) (desirable with values above 0.95), as well as chi-square and its ratio with the degrees of freedom (below 5) have been considered (Hooper et al., 2008).

K-means cluster analysis was applied to these three factors. To determine the number of clusters to extract, the elbow method (Thorndike, 1953) has been used, observing the loss of internal heterogeneity as the number of retained clusters increases. Where the slope decreases steeply, it is determined as the number of clusters to obtain. Subsequently, the means of the variables in each cluster have been analyzed, as well as, using chi-square and Haberman's corrected standardized residuals analysis, the relationship of the clusters with the rest of the socio-demographic variables, in order to name and interpret the clusters and study possible influencing factors (Hair et al., 2018; Husson, Le, & Pagès, 2017).

The cleaning and debugging of the database, in addition to the descriptive section and the performance of the segmentation analysis took place with the SPSS v.28 statistical software IBM Corp., 2021). For its part, both the factor analysis and the construction of the clusters were programmed in the R language (R Core Team, 2022).

## 3. Results and discussion

### 3.1. Distribution of the sample

After distribution of the survey, 681 responses were collected. This figure allows us to offer a first approximation to the attitudes and feelings of the Spanish population about the UGS, whereas not to extrapolate or lower these results to the general opinion. Table 1 presents the main results on the demographic characteristics of the respondents to the survey.

It can be seen that the predominant profile of respondents according to variable is: by sex, women; by habitat, population living in cities with >100,000 inhabitants; by age, the 50–59 age group predominates; by employment, public and private employees; and by level of studies, those holding a master's degree or higher postgraduate degree. This profile coincides in some of its characteristics with those obtained in

**Table 1**  
Socio-demographic distribution of respondents.

		Frequency	Percentage
Gender	Male	244	35.9 %
	Female	435	64.1
Habitat	Large city (>100,000 hab.)	351	51.6
	Small city(<100,000 hab.)	182	26.8
	Village/ rural area	147	21.6
Age	Under 40	160	23.5
	Between 41 and 49	144	28.5
	Between 50 and 59	221	32.5
	Over 60	105	15.4
Employment	Public/private employee	428	62.9
	Freelance	104	15.3
	Inactive population	148	21.8
Education	Compulsory education	97	14.3
	Degree	274	40.3
	Postgraduate	309	45.4

Source: own elaboration.

other studies. In the International exploratory study on the use and perceptions of UGS during the COVID-19 pandemic, the majority of respondents in the remaining countries considered were women, with percentages even higher than those of Spain in Lithuania (84 %), Croatia (76 %) and Slovenia (74 %) (Ugolini et al., 2020). In another study conducted in New York, 70 % of the 1145 respondents identified as female (López et al., 2021). Regarding age, that of the Spanish sample is slightly higher than that of other countries. Although some studies show that online surveys promoted by social media are more attractive to younger population groups (Borden et al., 2006; Gorzelany et al., 2022), in our study the results could have been influenced by the method of distribution of the survey, which due to the COVID-19 pandemic situation began among the authors' most direct contacts, which included members of scientific associations, academics, professionals from public and private companies, which places the age group of 50–59 years as the most dominant. The fact that most of the respondents reported living in cities with >100,000 inhabitants is also similar to the studies carried out in Croatia (Marin et al., 2021) and Italy (Ugolini et al., 2021). In relation to educational level, our study coincides with that of New York, in which the percentage of respondents who have postgraduate studies and held a master's degree is 45 % in both cases (López et al., 2021).

### 3.2. Uses and perspectives of urban green spaces before and during the pandemic

Based on the filter caption: *Before the pandemic*, the question “did you go to urban green spaces?” obtained 590 positive responses (86.6 %), which in the first instance gives us the information that 91 (13.4 %, original  $N = 681$ ) respondents did not use to visit urban green spaces. This percentage includes the population group whose reasons for not visiting parks would be not only of a socioeconomic nature or because they live in deprived areas with little green space (Boyd et al., 2018), but also those who affirm “Being busy with work or study”, “Feeling too tired, lazy or preferring to stay at home”, “Preferring indoor activities”, “Having no interest in parks in general”, or “Difficult to fit into a perfectly established work routine” (Hitching, 2013; Uijtewilligen et al., 2019).

Among those who do use urban green infrastructure, we observe the following distribution. To the question: *How far away is the urban green space you use to go frequently?*, 62 % of respondents stated that it is more than half a kilometer from their usual place of residence, with only 4.6 % of respondents having a UGS within 200 m distance from their residence. These data further highlight the need to implement the 3–30–300 rule, which proposes the minimum criteria to provide 3 trees from every home, 30 % tree canopy cover in every neighborhood and 300 m from the nearest green space (Konijnendijk, 2021). Regarding the type of green space, the count is somewhat more heterogeneous, with 47.5 % of users going to parks, 19.5 % to green spaces outside the city (peri-urban green areas), 18 % to riverbanks or promenades, and around 6.5 % choosing gardens or woodlands and forests. It should be noted that 2.5 % of the sample only went to squares or tree-lined streets. The high percentage of preferences for urban parks and green areas outside the cities chosen by the respondents is in line with the type of green areas preferred by the respondents from other Mediterranean countries (Marin et al., 2021; Ugolini et al., 2020, 2021), but they differ from those in other areas of Europe where the population prefers to visit more central green spaces, with a high aesthetic quality and a large number of amenities (Noszczyk et al., 2022; Robinson et al., 2022). However, there are some peculiarities of the Spanish sample that deserve to be mentioned. 18 % of those surveyed selected riverbanks or promenades as the type of green space they used to visit. The promenades are paths for strolling, walking or riding that have also been used in the regeneration of urban riverbanks (Kristiánová, 2018). 34 % of the respondents were from cities such as Madrid, Palencia, Granada, Zaragoza, Pamplona or Lugo, in which large-scale projects have been carried out to recover highly degraded river areas in their urban course, which has

allowed them to become use zones and recreation for the population (Eg. Project for the recovery of the banks of the Carrión river, Palencia, Ortega Merino, 2018; Water Park in Zaragoza, Díaz-Redondo et al., 2018; Management of the fluvial area of Pamplona, Cabrejas-Martínez, 2018). The other aspect to highlight is that although only 2.5 % of the respondents included the squares, this type of UGS, which is usually grouped in the so-called pocket parks, is usually the most abundant type of green infrastructure element in Mediterranean cities (Delgado-Capel & Cariñanos, 2020), in addition to one of the most used spaces for intergenerational socialization (Latasa & Laurenz, 2023; Maradiaga-Marín & Cariñanos, 2021; Rosso, Coppa, Spitzmiller, & Ferrero, 2022).

Lastly, 79 % of the participants said that they went to these green areas on foot, the second preferred option being by car, with motorbike, public transport and electric scooter being the residual options. These means of reaching the UGS by the respondent population coincide in some aspects with those of other European countries, although walking in Spain is much more frequent than in Croatia, Italy and Lithuania, and on the contrary the use of the bicycle to reach the UGS is among the lowest of all participating countries (Ugolini et al., 2020). The average frequency of attendance at UGS is several times a week, followed by several times a month. Comparing these results with the aggregated European data, only Slovenia and Spain state that they visit a green space more than once a week. Italy also recorded the highest percentage for the option several times a month. Few respondents, ranging from 0 % in Slovenia to 7 % in Lithuania, declared going to UGS less than once a month (Ugolini et al., 2020).

As for the activities that the population used to practice before the lockdown (Fig. 1a), (29 % of respondents) went to urban parks and gardens to practice sport, followed by the option to observe nature (25 %). Previous studies have found a positive relationship between the availability of green space and the practice of physical activities, especially for the Spanish population living in urban areas (García de Jalón et al., 2021). It is surprising that observing nature is the second most performed activity, since previous studies placed this activity among the least noted in urban parks, due to the fact that the population continued to consider as nature everything that is outside the city (Priego et al., 2008). The options of walking the dog, relaxing and playing with children show similar results, with the reason for going to UGS being approximately 13 % of the respondents in all three cases. In contrast, socializing and reading were among the least selected motives in the sample. This aspect may be conditioned by the predominant profile of the sample participating in this study, since socializing is one of the activities preferred by Spanish children and adolescents (Adinolfi et al., 2014; Garcia-Garcia et al., 2020), as well as by the population over 65 years of age (Higueras et al., 2021).

Fig. 1b displays the usage of the UGS by the population during the strictest period of the COVID-19 pandemic, when it was not allowed to carry out activities outdoor, except for those considered essential, in comparison to the previous result. Among those who attended a UGS during the pandemic (less than 35 % of the total respondents), 13.8 % did so to walk their dog, while others went to do sport (7.6 %) or observe nature (4.5 %). Very few people (0.2 and 0.1 respectively), selected visiting UGS for reading or socializing. These results are different compared to the European results, since practicing sports was the main reason for going to green spaces during the COVID-19 pandemic in all countries except Spain and Lithuania. Taking children for walks was only the most selected option in Croatia (Ugolini et al., 2020). These results differ, however, from other places where visits to urban green spaces were not strictly restricted during the pandemic, as was the case in the city of Krakow, in Poland. In it, up to 25 % of the 1350 respondents to a survey visited the UGS more frequently or much more frequently than before the pandemic (Gorzelany et al., 2022), being the need to take a walk, improvement of general well-being, and reduction of stress levels the most frequently indicated reasons (Noszczyk et al., 2022).

The comparison between both situations (Fig. 1a and b highlights

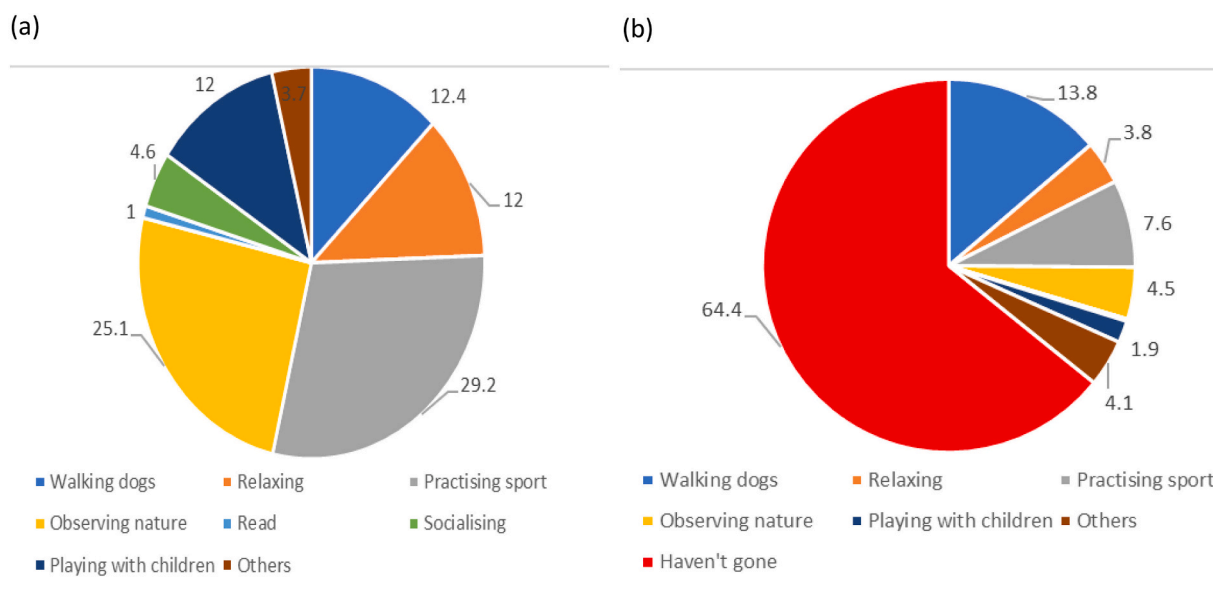


Fig. 1. Activities more frequently carried out in the UGS before and during the COVID-19 pandemic. Source: own elaboration.

some aspects that must be taken into account when implementing improvements in UGS, according to user preferences. Previous studies have indicated that the activities that are most frequently carried out in the UGS are governed by the intrinsic characteristics of the spaces, such as accessibility, design, maintenance, and richness and distribution of plant species (Adinolfi et al., 2014), since all of them have an effect on the attributes related to health and the aesthetic value of the space. Thus, to facilitate the practice of sport, not only the existence of adequate infrastructure such as specific paths or pavements should be considered (Voigt et al., 2014), but also the existence of outdoor fitness equipment for the aged population (Chow, 2013), and even the existence of playgrounds for children (Zuo et al., 2020). The existence of rest areas in the form of benches or other infrastructure allows the observation of nature, relaxation, rest and reflection (Gorzelay et al., 2022; Vieira Martins et al., 2019). To this we must add universal access measures that facilitate access for vulnerable groups (Güngör et al., 2016), and a series of biodiversity factors that generate ecological, landscape and environmental benefits, minimizing disservices (Cariñanos et al., 2017; Talal & Santelmann, 2019). Therefore, it is necessary to review the factors, characteristics and attributes of these spaces in order to maximize their multifunctionality and their readiness in the face of the needs of the population and upcoming challenges (Gorzelay et al., 2022; Maradiaga-Marín & Cariñanos, 2021).

In a cross-table analysis (Table 2) between the different reasons to

Table 2  
Reasons for visiting an urban green space before the pandemic and age of the respondent.

	Under 40	Between 41 and 49	Between 50 and 59	Over 60
Walking dogs	3.1	3.6	3.9	1.9
Relaxing	3.6	3.4	3.9	1.2
Practising sport	5.3	7.5	10.3	6.1
Observing nature	6.1	5.8	9.2	4.1
Read	0.3		0.3	0.3
Socializing	1.4	2.2	0.7	0.3
Playing with children	2.9	7.1	1.4	0.7
Others	1.4	0.2	1.9	0.3
Total	23.9	29.7	31.5	14.9

Source: own elaboration.

visit urban green spaces BEFORE the lockdown and the age of the respondents, with a bilateral asymptotic significance of,000, it can be affirmed that the type of occupation of urban green spaces is closely related to the age of the user. The distribution shows that the group with the highest total occupancy of the parks is between 50 and 59 years of age, with the exception of the option to play with children, whose main respondents are under 49 years of age. This distribution can be explained, according to Ode Sang et al. (2016), by the fact that older residents participate in a greater number of nature-related activities than younger residents and also they see greater aesthetic values and have higher well-being associated with urban green spaces than younger people.

### 3.3. The socio-demographic profile of fear in the UGS: segmentation analysis

As it was stated in the objectives of the work, we wanted to make a particular analysis of some factors that highlight differences in use and perception with a gender perspective approach, such as the feeling of fear in UGS. To identify the variables that best explain (in 67.74 % of cases) the behaviour of the dependent variable, a binary logistic regression analysis was carried out. The independent variables that predict fear at night in a UGS are: gender, age and habitat. Following this technique, a segmentation analysis was developed to assess the nodes or profiles that explain the probability of feeling fear or not in an urban green space at night (Fig. 3).

In Fig. 2, 6 nodes of statistical interest are observed. The usefulness of the nodes is that they compare several different models to obtain binary results, allowing the best approach to be selected for analysis. The first two correspond, respectively, to women and men under 40 years of age. The third and fourth nodes are both female, the former referring to public or private employees and the latter to the inactive population, entrepreneurs and freelancers; in both cases older than 40. The last two nodes refer to men over 40 years old, living either in small cities (<100,000 inhabitants) or in the residential extremes: large cities (>100,000 inhabitants) and small rural municipalities. All these nodes maximize the relationship and explanation of the dependent variable: being afraid at night in an urban green space. After analysing the frequency of the reasons that provoke fear at night in green spaces, the following distribution emerges: nothing (22.9 %), darkness (20.3 %), loneliness (9.1 %), insecurity or crime (37.6 %) and others (10 %). In

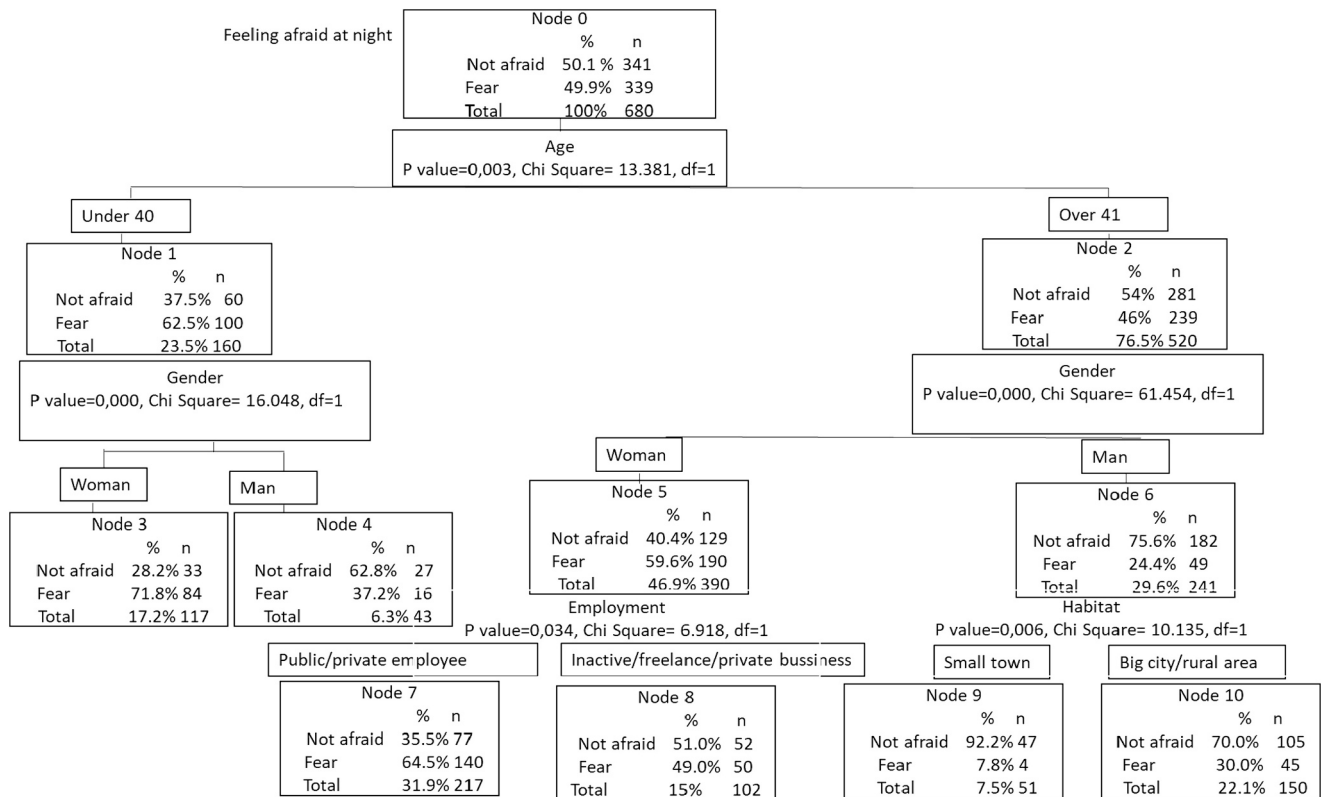


Fig. 2. Segmentation analysis showing the profiles explaining the probability of feeling fear in urban green spaces at night. Source: own elaboration. (For interpretation of the references to color in this figure legend, the reader is referred to the web version of this article.)

this category “Other”, the most repeated response before coding was dangerous animals, but not sufficiently important to constitute a category of its own. Responses such as homeless people or evil spirits are also collected.

In a first analysis, it can be seen that being under 40 years of age means a 62.5 % probability of feeling afraid at night in a green space. However, being older than 40 reduces this probability by 16.5 points (46 %). These results are consistent with those offered by the survey on mental health conducted by the Spanish Sociological Research Centre, which shows that people over 40 are less likely to feel fear or dread in a variety of situations (CIS, 2021). This is due to the high levels of anxiety and mental instability that in recent times plague young people in Spain (Fundación Mutua Madrileña, 2022).

The relationship between gender and feelings of insecurity in public spaces has been widely studied in several researches (Rodríguez-García, 2021; Sotiriou & Chryssanthi, 2022; Triguero-Mas et al., 2022). And this study points in the same direction. The data show that both young women (71.8 %) and women over 40 (59.6 %) are highly likely to be afraid at night in a park. Patriarchal violence and women's vulnerability to male chauvinist attacks generate in half of the population a feeling of fear when carrying out everyday activities such as enjoying an evening stroll in an urban garden. In terms of Topcu (2020), access to urban green spaces crosses the domain of masculinity. Within women, we observe that the node where women are least likely to be afraid corresponds to the profile of women over 40 who are retired, unemployed or self-employed. The difference between this profile and that of women of the same age who work as employees is 15.5 %.

Among the male population, relatively low values of night-time fear in urban green spaces are observed. The male socio-demographic profile with the highest probability of feeling fear (37.2 %) is found among young men, probably due to the same explanation as in the case of young women. Among adults over the age of forty, there is a substantial difference in reporting fear depending on the habitat of residence. Only 7.8

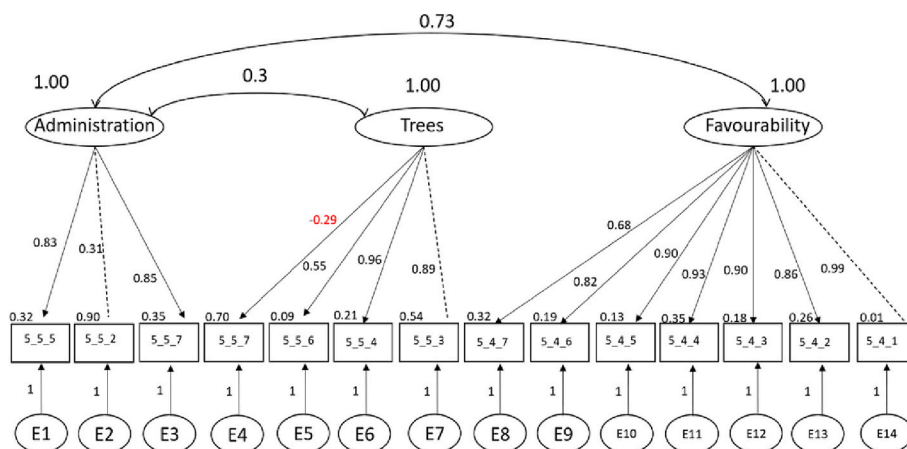
% of men living in medium-sized cities (with a population of <100,000 inhabitants) reported feeling frightened at night in a park. This figure presents a difference of 22.2 points with respect to the inhabitants of towns and large cities. These data are consistent with Spain's crime rates, as it is systematically the large cities that lead in violent crime, property crime and citizen insecurity (Spanish Ministry of the Interior, 2021). In any case, according to Interior Ministry sources, the number of registered robberies with violence has decreased from 96,607 in 2012 to 45,344 in 2020, the lowest figure recorded to date. Data for the last quarter of 2022 increased this number to 63,711 violent robberies (Spanish Ministry of the Interior, 2021).

### 3.4. Visitors to UGS: factor and cluster analyses

In order to classify the sample according to their degree of acceptance of different items, a confirmatory factor analysis was carried out (Fig. 3). To this end, the variables under study were grouped according to a theoretical thematic criterion. This grouping resulted in three determining factors: Favorability towards green spaces, opinions on urban trees and requirements to administration in terms of management and maintenance of UGS.

Confirmatory factor analysis to classify the sample according to their degree of acceptance of requirements to the administration in terms of management and maintenance of urban green spaces, opinions on urban trees and favorability towards green spaces.

The factor “Favorability towards green spaces” includes the variables: Green areas improve public health (5\_4\_1); The presence of green areas encourages socialization(5\_4\_2); Frequenting green areas increases environmental awareness (5\_4\_3); Access to green areas is a primary right for all citizens (5\_4\_4); Everyone should have access to a green area within 300 m from home (5\_4\_5); Frequenting green areas increases solidarity (5\_4\_6); The presence of green areas is beneficial because it increases the property value of homes (5\_4\_7). These items were



**Fig. 3.** Confirmatory factor analysis  
 Source: own elaboration. RMSEA: 0.06; CFI: 0.997; TLI: 0.996; ji-cuadrado: 0.000, *p*-value: 0.000.

designed in the questionnaire with a positive formulation, as the intention was to measure the extent to which the surveyed population agreed with the ecosystem services provided by urban green spaces (Amorin et al., 2021; Lin & Russo, 2021). These benefits that humans obtain from nature are the highest expression of the nature-society relationship (Sahagún et al., 2020).

In the factor “Opinions on urban trees (called Trees)”, are included: Trees along the streets pose a risk to people (5\_5\_3); Trees along the streets cause practical problems (e.g. for parking, pruning, leaf fall) (5\_5\_4); Trees along the streets pose a risk to people; For improving traffic flow, trees should be removed from streets (5\_5\_6); Building construction should be compensated for by the provision of new green space (5\_5\_7). On the contrary, these items were formulated in negative, except for statement 5\_5\_7. The aim was to measure the negative externality of urban trees in streets and squares, on the understanding that they could cause problems for the normal development of city dynamics. Likewise, the opinion on trees was reflected in the concern that new constructions should compensate for the negative effects they cause. In other words, the aim was to verify the importance that the population attached to trees, despite the fact that they were obliged to take a stance on their services. This seems to be in line with the findings of a review carried out by Ordóñez Barona et al. (2022), which indicated that many of the urban forests research were mainly focused on the positive aspects of trees and few addressed the negative consequences or disservices that may exist (Cariñanos et al., 2017). Other studies on the population's perception of trees are also more focused on their aesthetic value than on the environmental, ecological, economic and social values they have (Ordóñez et al., 2017). Being aware of them means identifying the challenges facing green infrastructure and possible ways of reducing the disadvantages they cause (Roy et al., 2012).

In the factor “Requirements to the administration in terms of management and maintenance of urban green spaces”, we find the variables: The green area that I usually visit should be more inviting (5\_5\_2); More funding should be given to urban green maintenance (5\_5\_5); Building construction should be compensated for by the provision of new green space (5\_5\_7).

This third factor captures the attitudes of the sample towards the responsibility of institutions or administrations for the condition and consequences of urban green spaces. These items have been constructed taking into account the need for administrations to be transparent and to explain the pros and cons of each option in ornamental gardening, based on technical criteria and following the indications of the World Health Organisation (Pereira et al., 2021). And all of this should be framed within a process of naturalization and the right to the city.

As can be seen, item 5\_5\_7 saturates the factor of trees and administration, as it asks for an evaluation of the statement “Building

construction should be compensated for by the provision of new green space”, which in the collective imagination also refers to trees and their management, given that constructions tend to damage them.

As for the fit indices of the proposed model, it is worth noting that the results of these remain within the parameters required for a correct fit, although bordering on the limits of the undesirable. The RMSEA value obtained is 0.06, being the exact line of what is considered acceptable for the model. The chi-square and *p*-value results reach absolute significance (0.000), thus strengthening the model. TLI and CLI need to be above 0.95 to be considered acceptable, therefore, although adjusted to 0.997 and 0.996, they allow the model to be considered successful.

Once the results of the confirmatory factor analysis were obtained, the elbow method test (Supp. Material Fig. 1) was performed to determine how many clusters it was appropriate to construct according to the gain in internal homogeneity of each cluster (Thorndike, 1953). As can be seen in Figs. 4 and 5, in order to gain maximum internal homogeneity and heterogeneity between clusters, the best option was to construct 5 clusters. This figure allows us to represent a reasonable number of clusters between which significant differences are observed without being too many and making the analyses too conjunctural. Constructing a larger number of clusters did not imply reducing the internal heterogeneity of the clusters.

Once the number of clusters to be constructed has been defined, each one of them has been placed on the axes, named after the factor variables obtained (for this reason the clusters are named as clusterF; F of factorised or from the factors). After the joint analysis of the two previously offered graphs (understood as a three-dimensional graph but represented in two figures), the following sample clusters are obtained. The purple color represents those people (150 cases) who show a high average demand towards the administration with regard to the maintenance and management of urban parks and gardens, but a low favourability towards green spaces and a high rejection of the disservices caused by trees in squares and streets. This cluster is called critical. Blue shows the most demanding group (152 cases), characterized by an intense demand for the administration to carry out its functions, high recognition of the eco-social potential of urban green spaces and at the same time a high level of rejection of trees. In green (85 cases), and calling themselves comfortable, we recognize a segment of the population who do not express their demands to the administration because they are relatively satisfied with its management, who show little interest in parks and gardens, and who are not particularly bothered by the negative externalities of trees in cities. In the fourth score of the population gradation with respect to UGS, the group coloured yellow (210 cases) has been named Allies. Allies are defined as being rather passive in holding the administration accountable for the performance of its functions, their average favorability towards green places but their



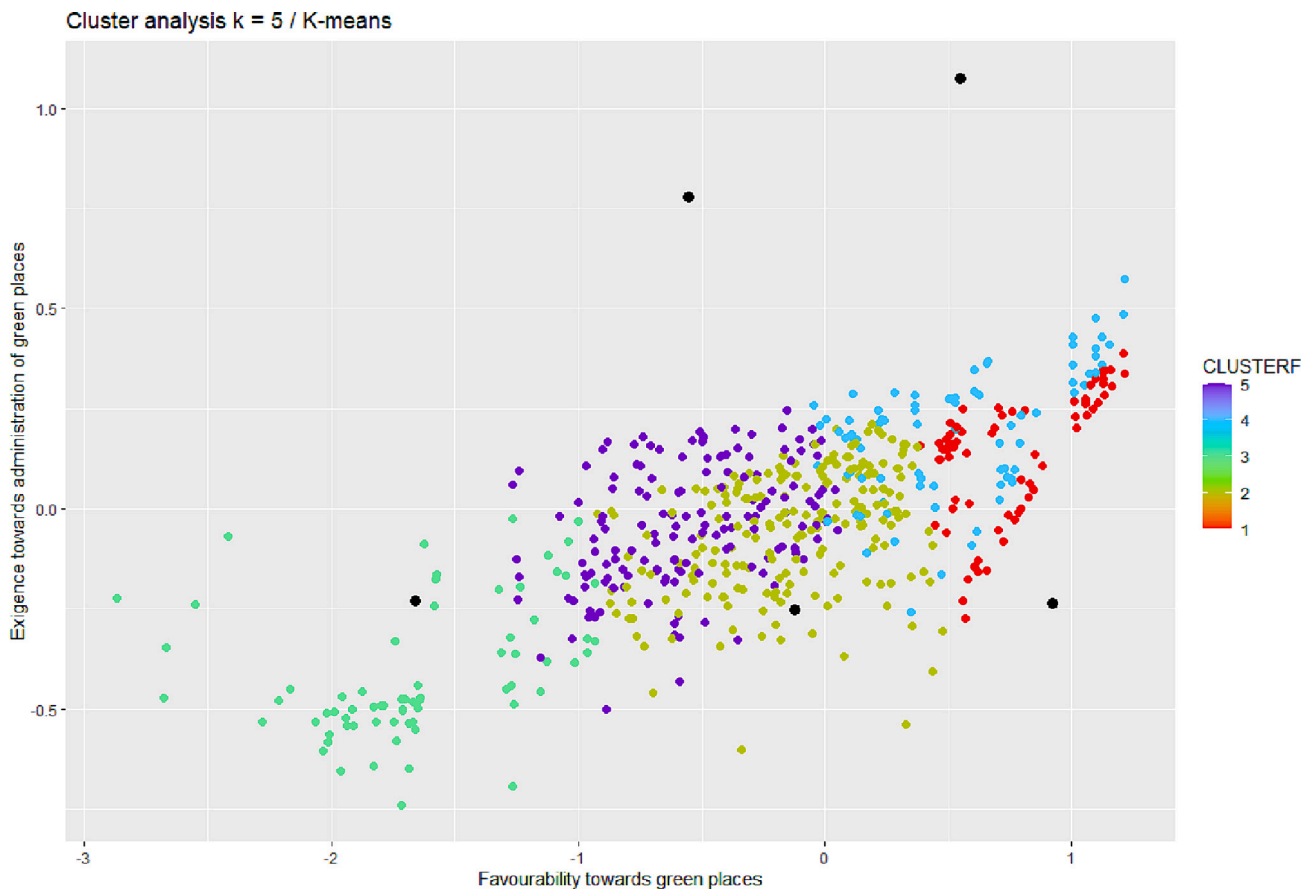


Fig. 4. Favourability versus requirements towards administration  
Source: own elaboration.

intense advocacy for urban trees. Finally, the UGS fan group, the cluster coloured red (82 respondents), is characterized by its high demand on the administration, its very high favorability towards urban parks and gardens and its low rejection of tree services. These last two groups are the ones that would have the greatest willingness to be part of the increasingly growing citizen movements that carry out the maintenance of public green spaces or “place-keeping”, since although they show a different degree of demand to the administration, its high favorability towards green spaces can highlight its adaptive capacity to adapt to new changes in a long-term management of green spaces (Mattijssen et al., 2017).

When crossing these clusters with the socio-demographic variables of the surveyed population, it should be recognized firstly that no significant differences have been identified between clusters according to sex, employment or habitat. On the other hand, the Chi Square tests carried out between the clusters and the variables age and education are significant, with a result of  $p\text{-value} = 0.03691b$  and  $= 0.02956$  respectively. The results of the Chi Square test show that the “critical” and “demanding” clusters are made up of the youngest respondents, with a significant proportion of those under 40 years of age in both clusters and those aged between 41 and 49 in the demanding group (Phillips et al., 2021). Respondents with the highest educational qualifications, university degree or postgraduate degree, are more likely to be in the red and yellow clusters, i.e. “allies” and “UGS fans”.

#### 4. Conclusions

In this paper we have analyzed the results of a survey on the uses, attitudes and feelings of the Spanish population surveyed towards urban green spaces, and the perception of them before and during the COVID-

19. Although it is a subject widely covered in the literature, in this case an interdisciplinary approach has been taken, trying to blend the long sociological tradition of building sociodemographic profiles with the main related issues (without denying the need for improvement) of parks and gardens, urban forests in general, in Spanish cities. To this end, three research questions were posed. The first question sought to explore the changes in the frequency and type of use of urban green-spaces that COVID-19 had caused. The analysis of the data shows the great impact that the measures implemented by the National Government as a result of the pandemic had on the users of the UGS, such as the change in the activities carried out by the different groups of users. But it has also been highlighted that in many of the localities represented, the recommendations of having a green area within a short distance are far from being met, since more than half of the sample declares that they live at a distance greater than a thousand meters from their usual green space. In attention to the favorite activities of the respondents, it is observed that the landscape value of the UGS is recognized mainly by the elderly, reducing the use of the parks in those under 50 to playing with children and walking the dog. In other words, it is possible to affirm the instrumentalization of urban green spaces by young people and not their recreational or naturalistic use.

This study has paid particular attention to the socio-demographic profile of fear, which was the second research question asked. The results have highlighted that young women (under 40) and wage earners were the most likely to be afraid at night in a park due to insecurity or terror of suffering some abuse or crime against them. This situation may be mainly supported by the traditional patriarchal gap that exists in the feeling caused by urban green areas, and by women's vulnerability to male chauvinist attacks, which have caused more than half of the women participating in this survey to feel afraid to carry out certain

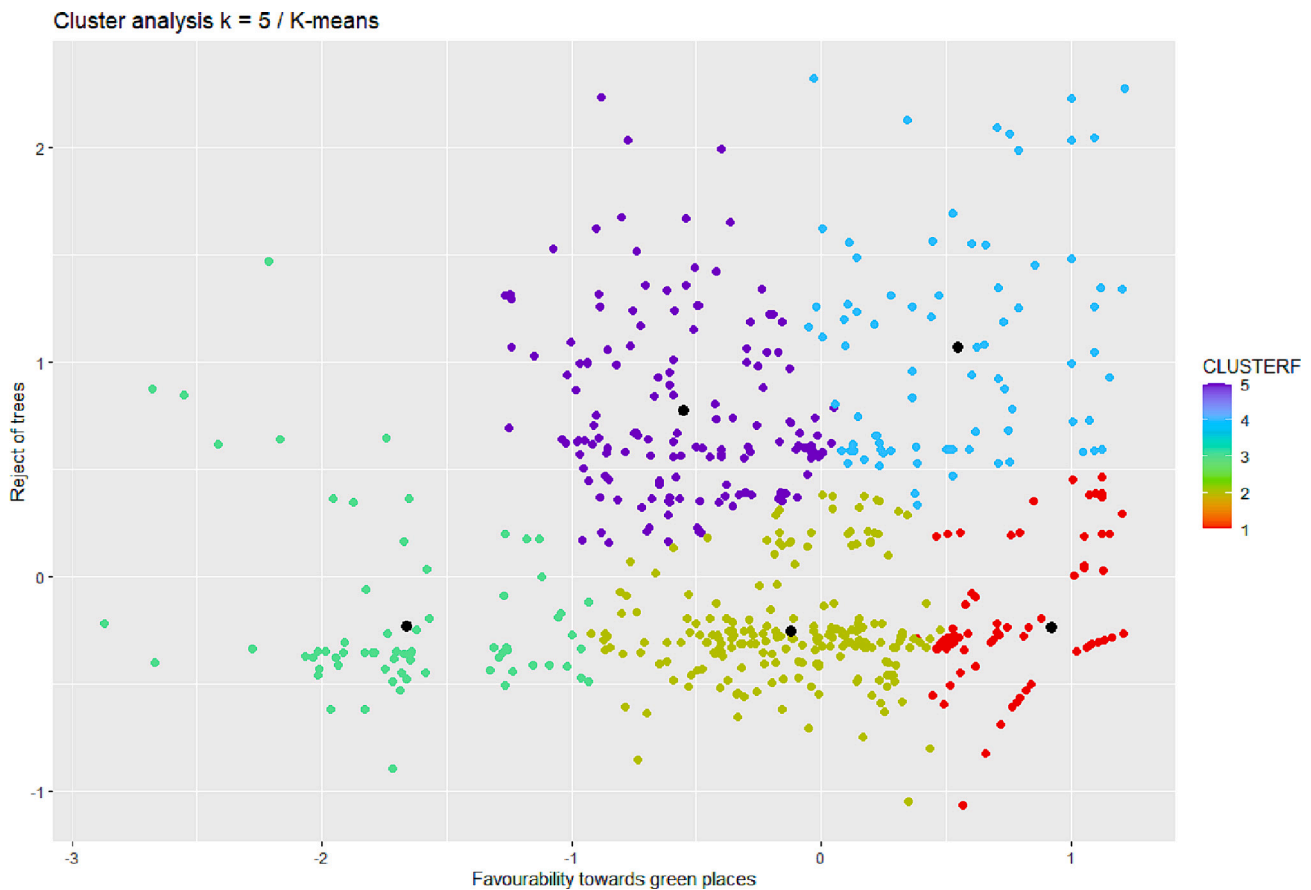


Fig. 5. Favourability versus rejection of trees planting  
Source: own elaboration.

activities in UGS at certain hours of the day. Parks, and public space in general, should be a space for relaxation and recreation for the entire population, not exclusively for the male half. The georeferencing of fear in parks and gardens by women manifests a public security problem that must be addressed jointly by administrations, activism and scientific research.

Regarding the third research question, about the degree of acceptance of the population on different aspects of the UGS, the results have shown that the population recognizes the important benefits for physical and mental health that these spaces provide, showing a high degree of favorability towards them. However, they also recognize some risks or disservices associated with the presence of urban trees, and how their proper management can improve urban green infrastructure services. This last aspect is corroborated by the high demand expressed for the administration to carry out proper management and maintenance of urban green areas. Once again, it is the group of people under 40 who presents the most critical and demanding positions towards the administration, the trees and the general favorability towards the UGS. It is the educational level that is shown to explain more optimistic perceptions towards urban green spaces in a directly proportional relationship.

As a general conclusion, it can be said that this work provides relevant information to be attended when rethinking and redesigning urban green spaces so that they accommodate the real needs of the population, and can ensure universal access to safe, inclusive and accessible green areas and public spaces, particularly for women and children, the elderly and people with disabilities (Target 11.6, of SDG 11 Sustainable Cities and Communities). The results of this research delve into this consideration and include the age gap in the use and perception of urban green spaces.

## 5. Limitations of the study

One of the limitations of our research is that in survey respondents were overwhelmed well-educated people and women. As expressed in the methodology, the research team of this study distributed the samples among their personal and professional contacts, often colleagues from the university environment, which explains this over-dimension of people with higher education among the respondents. In any case, it has been demonstrated in other studies (Busby & Yoshida, 2015; Phillips et al., 2021) that the overrepresentation of respondents with higher education is common in self-administered online surveys, since people with low education tend to abandon the questionnaire when they do not understand some question or instruction and not have someone to guide you. A similar bias is common in response to surveys based on sex, with women being much more likely to participate than men (Sax et al., 2003). Another limitation that must be mentioned is that although the survey was originally designed in Italian by researchers from the Institute of Bioeconomics of the Italian National Research Council (CNR), it was first translated into English for the concise formulation of the questions and from English to the different official languages of the participating countries, in our case only to one of the official languages of Spain, such as Spanish. Not translating into other official languages of the country (Galician, Catalan, Basque), and not maintaining a form in English that could be answered by foreigners living in Spain, could have helped to have not only a greater number of responses and perspectives, but also a greater representativeness of the regional territories where official languages other than Spanish are spoken.

Regarding the number of surveys that we managed to collect, as has been explained throughout the manuscript, we must recognize its insufficiency to infer our assertions to the whole of Spanish society.

However, 681 questionnaires allow us to offer an exploratory description of the uses and perceptions of the target population. Although some studies highlight that inferential statistical techniques are considered robust and reliable when there are >200 cases (Fabrigar et al., 1999), we are aware that our results have the bias of a study that could not be designed in the appropriate way that this type of study requires, since being carried out during the strictest period of confinement due to COVID-19 and being part of a European study, many decisions had to be made in a framework of exceptional and extraordinary circumstances.

### CRedit authorship contribution statement

**Paloma Egea-Cariñanos:** Conceptualization, Methodology, Data curation, Formal analysis, Writing-original draft. **Pedro Calaza-Martínez:** Investigation, Writing-original draft. **Daniel López Roche:** Conceptualization, Methodology, Data curation, Formal analysis. **Paloma Cariñanos:** Conceptualization, Supervision, Investigation, Data curation, Writing-original draft.

### Declaration of competing interest

The authors reported no declaration of interest.

### Data availability

Data will be made available on request.

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### Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.cities.2024.104996>.

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