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Characteristics that Encourage Visits to Public Open Spaces: A Discrete Choice Experiment Using Photomontages in Three Ecuadorian Cities

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Characteristics that Encourage Visits to Public Open Spaces: A Discrete Choice Experiment Using Photomontages in Three Ecuadorian Cities

Abstract

Public open spaces offer a wide range of benefits to the community; however, more clarity is needed on how people value their diverse conditions. This study focused on understanding user preferences when choosing these spaces. A virtual discrete choice experiment was carried out where participants were shown images of public spaces with different characteristics and were asked to select their preferences. Of the 758 responses, five main characteristics were identified that influenced their choices: shade from trees, abundance of trees, artistic expression in public space, presence of indoor paths, and grass areas. These preferences were also related to intangible qualities such as friendliness and safety, as well as typologies such as parks or squares. The importance of natural elements, adequate facilities, and activities or expressions was highlighted for the success of public spaces. This knowledge can be essential when designing public spaces or planning urban policies.

Keywords: public open spaces, user preferences, discrete choice experiment.

Características que promueven visitas a espacios públicos abiertos: experimento de elección discreta mediante fotomontajes en tres ciudades ecuatorianas

Resumen

Los espacios públicos abiertos ofrecen una amplia gama de beneficios a la comunidad, sin embargo, es fundamental tener más claridad sobre cómo las personas valoran sus diversas condiciones. Este estudio se centró en comprender las preferencias de los usuarios a la hora de elegir estos espacios. Se llevó a cabo un experimento de elección discreta virtual en el que se presentaron imágenes de espacios públicos con diferentes características a los participantes y se les pidió que seleccionaran sus preferencias. De las 758 respuestas, se identificaron cinco características principales que influyeron en sus preferencias: sombra de árboles, abundancia de árboles, expresiones artísticas en el espacio público, presencia de caminos interiores y zonas de césped. Estas preferencias también se relacionaron con cualidades intangibles como amigable y seguro, así como con tipologías como parques o plazas. Se destacó la importancia de los elementos naturales, las instalaciones adecuadas y las actividades o expresiones para el éxito de los espacios públicos. Este conocimiento puede ser esencial a la hora de diseñar espacios públicos o planificar políticas urbanas.

Palabras clave: espacios públicos abiertos, preferencias de usuarios, experimento de elección discreta.

Características que promovem visitas a espaços públicos abertos: um experimento de escolha discreta mediante fotomontagens em três cidades equatorianas

Resumo

Os espaços públicos abertos oferecem uma ampla gama de benefícios à comunidade, mas é fundamental ter mais clareza sobre como as pessoas valorizam suas diversas condições. Este estudo se concentrou em compreender as preferências dos usuários na hora de escolher estes espaços. Foi realizado um experimento de escolha discreta virtual onde os participantes foram apresentados a imagens de espaços públicos com diferentes características e solicitados a selecionar suas preferências. Das 758 respostas, foram identificadas cinco características principais que influenciaram suas preferências: sombra de árvores, abundância de árvores, expressões artísticas no espaço público, presença de caminhos internos e áreas gramadas. Estas preferências também foram relacionadas a qualidades intangíveis como amabilidade e segurança, da mesma maneira que com tipologias como parques ou praças. Foi destacada a importância dos elementos naturais, as instalações adequadas e as atividades ou expressões para o sucesso dos espaços públicos. Este conhecimento pode ser essencial no momento de projetar espaços públicos ou planejar políticas urbanas.

Palavras-chave: espaços públicos abertos, preferências do usuário, experimento de escolha discreta.

Introduction

Over the years, public open spaces (POS) have been considered settings used to promote social inclusion (Askari & Soltani, 2019), and their success has often been measured by their frequency of use (Askari & Soltani, 2019; Fermino *et al.,* 2013), as a characteristic intrinsically linked to their physical quality *(Kalniņa & Ņitavska, 2018).* Multiple and diverse aspects make up the notion of public open space, but its main characteristics are described as "unbuilt area or open space with recreational, cultural, civic, or natural purposes; with unrestricted and costless access to an entire community" (Naranjo *et al.*, 2020, p. 62).

This study aims to understand the importance of the characteristics of public open spaces in Ecuadorian cities as perceived by their inhabitants. It seeks to address the deficiencies in previous research that had focused solely on evaluating the quality of public open spaces, without considering user preferences. Three research questions are planned: (1) What are the main features of a public open space that encourage citizens to visit it? (2) Is there a connection between the typologies of public open spaces and any of their characteristics? (3) Is there a connection between the intangible qualities of public spaces and any of their characteristics? Using photomontages in a discrete choice experiment, this study sheds new light on understanding user preferences for a wide range of characteristics in public open spaces in Ecuador and Latin America. The research results could guide decision-makers and urban planners in identifying intervention alternatives and prioritizing characteristics to meet user expectations.

Problem statement and conceptual framework

Several studies within the field of urban planning have been made to get to know the aspects that determine the quality of public spaces and that positively influence their use (Askari & Soltani, 2019; Fermino *et al.*, 2013). These aspects can be objective characteristics, easily observable and quantifiable, and subjective aspects, which include intangible perceptions.

Physical and aesthetic attributes address permanent, tangible, and visible qualities of a public space, and include constructed or natural characteristics of POS like vegetation, amenities, physical characteristics, access features, and weather protection (Bohne *et al.*, 2015; Burton & Mitchell, 2006; Holland *et al.*, 2007; Lee & Hong, 2013; Rofè *et al.*, 2012; Wojnarowska, 2016; "You asked, we answered", 2016).

POS characteristics that enhance social cohesion often relate to intangible qualities, since they become promoters of activities, means for socialization, and, a key route of passage for a community (Koohsari *et al.*, 2015).

Tangible or non-tangible aspects of POS can lead to users´ engagement, fostering social and cultural relations and diversity. (Askari & Soltani, 2019; Carmona, 2021; Holland *et al.*, 2007; Mehta, 2014; Pasaogullari & Doratli, 2004; Wojnarowska, 2016; "You asked, we answered", 2016).

Another important aspect for POS is how it enhances environmental conditions, creating livable public spaces, and benefiting the wellbeing of users (Cilliers & Timmermans, 2016; Mishra *et al.*, 2020). Variables of this aspect include wooded areas, vegetated areas, and water features (Kalniņa & Ņitavska, 2018; Rofè *et al.*, 2012).

Authors argue that the environmental, physical and social aspects of a POS are closely linked, since these conditions influence the experience of users (Zamanifard *et al.*, 2019). They impact a wide range of perceptions, including comfort, accessibility, safety, behavior, symbolism, and significance. (Askari & Soltani, 2019; Burton & Mitchell, 2006; Fermino *et al.*, 2013; Holland *et al.*, 2007; Kalniņa & Ņitavska, 2018; Mehta, 2014; Pasaogullari & Doratli, 2004; Wojnarowska, 2016). Therefore, to assess a POS successfully, aspects and variables of a diverse nature must be studied.

Different categories have been created by authors to organize variables. Project for Public Spaces ("You asked, we answered", 2016) suggests a classification based on four key attributes: sociability, uses and activities, accessibility and connectivity, and comfort and image. Each of these attributes contains intangible qualities, used to describe a public space, and tangible variables which are evident and measurable. Andrade *et al.* (2020) suggest categorizing 41 variables into seven dimensions for assessing the quality of the POS: inclusion, significant activities, comfort, safety, pleasure, accessibility, and amenities.

Regarding South American cities, public spaces and public life are dominated by car-oriented planning (Crestani & Irazábal, 2020) and even though there have been important initiatives such as the New Urban Agenda (NUA) adopted at the Habitat III conference in Quito (United Nations, 2017), POS remain a minor concern on the public policy priorities (Bravo, 2020). Specifically, in Ecuador, public space has been studied and analyzed rather superficially. There are policy gaps and uncoordinated efforts, which range from the definition and typologies of public spaces to how its provision or quality are measured, resulting in questionable and often contradicting government reports (Andrade *et al.*, 2019). This scenario proves the necessity of studying diverse aspects of POS, citizen preferences among them.

Methods

Method selection

To study the effects of the conditions found in urban form and infrastructure on people's perception, natural experiments have proven to be useful since they can improve the decision-making process by providing sound evidence of the effects of a policy or an intervention (Leatherdale, 2019). Kestens et al. (2019) claim that there is a scarcity of natural experiments on urban form changes because of various limitations, but these limitations can be overcome through technological innovations. A study conducted by Van Hecke *et al.* (2018) revealed that using choice-based conjoint virtual experiments can be a cost-effective approach to tackle financial, logistic, or organizational challenges in natural experiments.

Physical modifications in public spaces are impractical for research due to resource and permit requirements. Virtual experiments that digitally manipulate environmental conditions can address these challenges, especially for determining user preferences for variations in public space elements (Veitch *et al.*, 2017)

Using a discrete choice experiment (DCE) can provide a methodological tool to evaluate the preferences of the population towards diverse park characteristics and conditions through a virtual experiment ("Technical points", 2020). Through this type of analysis, it is possible to evaluate the influence of a set of factors on the appeal to use public spaces by making the subjects choose from a set of manipulated photographs that varies in terms of the components and qualities of the public space they portray. It provides insights on how people value distinctive characteristics in any product, in this case, a POS, and which of these characteristics have a higher influence on the preference of the participants.

Because of its virtual nature, this experiment can only depict variables graphically, potentially excluding other attributes like temperature, smell, sound, or a comprehensive understanding of space. However, it is still a valuable technique, since it allows for a cost-effective and widely accessible alternative to gather the preferences of a diverse range of individuals who can easily share and view it in standard devices. In contrast, other more immersive methods, such as virtual reality (VR), can require specialized equipment and technical knowledge (Alsalameen *et al.,* 2023).

As discussed by Louviere *et al.* (2010), DCE has proven to be suitable for policy assessment and to be more consistent with the random utility theory (RUT) than other alternatives, arguing that using RUT may help explain choice behavior in humans more effectively because it considers not only an explainable (systematic) component, but also an unexplainable (random) component that could better reflect the variability in decisions made by individuals. Therefore, it "can predict the probability that an individual will choose an alternative, but not the exact alternative that an individual will choose" (Louviere *et al.*, 2010, p. 63).

For this study, the DCE analysis was based on the product variable selector tool (which uses MCMC Hierarchical Bayes) provided by the Conjoint.ly software, which assigns relative preference scores to each variable as numerical scores that measure the preference of the participants to each claim of the product (public spaces, in this case). The variables with higher scores are the ones that are mostly preferred by the participants, and the ones that are preferred the least receive lower scores. The scale of the chart is such that the sum of all the positive and negative values is equal to zero, meaning that a characteristic with a negative value does not imply that participants consider it as *bad,* but that its performance was inferior to that of other characteristics and that it has a lower position in the chart. All variables are assigned a *ranking* based on each of the characteristics, which is then sorted according to the results on relative preferences ("Technical points", 2020).

Variable selection and photograph processing

Variables were selected according to the findings in the literature review, which explored and summarized a diverse set of conditions that influence the perception of users toward a POS and, ultimately, shape the decision to visit it. This outline was holistic in the sense that it would consider the multiple aspects in which POS relate to public life. The "Place Diagram" from Project for Public Spaces ("You asked, we answered", 2016) was regarded as a valuable tool to match attributes and intangibles with variables that had a graphic representation (Table 1).

27 variables to be evaluated were chosen. Each of them could have, when relevant, up to three conditioning levels that represented different settings of the same characteristic. E.g., the number of people visiting a public space is depicted as many and few. The variables represented in multiple conditioning levels were not inherently undesirable for most participants. E.g., it was assumed that a person would not normally prefer a park with poor footpath maintenance. In such cases, only one conditioning level was presented for the variable, which was related to its desirable situation. These assumptions were made because other studies discovered that people strongly prefer public spaces with proper maintenance (Van Hecke *et al.*, 2018; Veitch *et al.*, 2017). The total number of features to be evaluated as photomontages, considering the different conditioning levels of some variables, was 49.

Processed images were accompanied by a brief description of the characteristic being evaluated by the respondent. The purpose was to make sure that the person looking at the image would consider only the intended variable and the conditioning level, avoiding any confusion with other elements present in the image (Figure 1).

Table 1.
Attributes, variables, and conditioning levels of the manipulated photographs

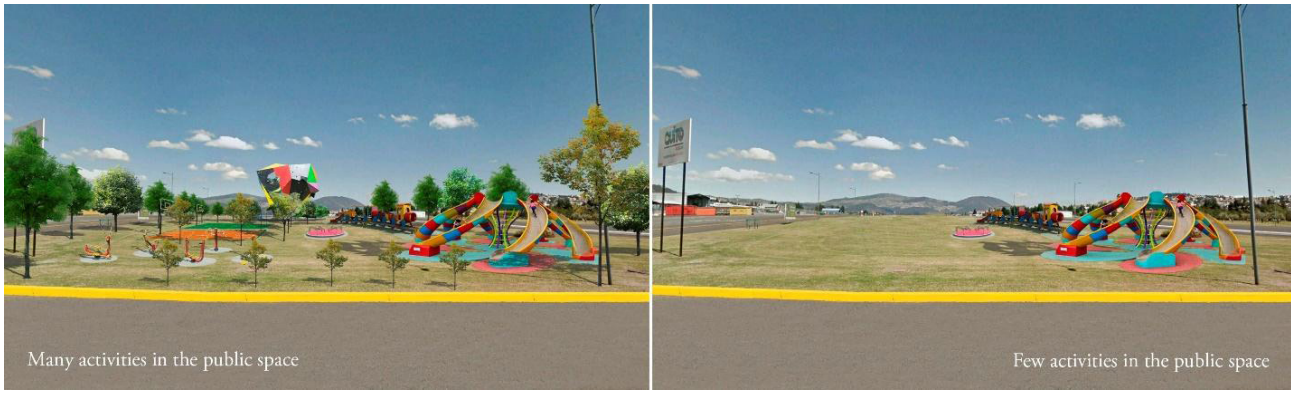
Attributes	Variables	Conditioning levels
Sociability	Number of women, children, and older adults	Many women, children, and older adults
		Few women, children, and older adults
	Number of people inside the public space	Many people
		Few people
Accessibility and connectivity	Number of vehicles around the public space	Many vehicles
		Few vehicles
	Number of bicycles around the public space	Many bicycles
		Few vehicles
	Perimeter walkways maintenance	Perimeter walkways in good condition
	Metal fences	No metal fences
		Partial metal fences
		Full metal fences
	Green fences	No green fences
		Partial green fences
		Full green fences

Attributes	Variables	Conditioning levels
Comfort and image	Number of trees	Many trees
		Few trees
		No trees
	Grass areas	With grass areas
		No grass areas
	Pergolas	Pergolas in the public space
	Tree shade	With tree shade
		No tree shade
	Benches	With benches
	Bodies of Water	Big ponds, fountains, or lakes
		Small ponds, fountains, or lakes
		No ponds, fountains, or lakes
	Security guard booths	With security guard booths
		Without security guard booths
	Security guards	With security guards
		Without security guards
	Art in the public space	Art expressions in the public space
	Artificial lighting during the night	Artificial lighting during the night
	Pet allowance	Pets allowed
		No Pets allowed
	Play structures	With play structures
		Without play structures
	Interior footpaths	Presence of interior footpaths

Attributes	Variables	Conditioning levels
Uses and activities	Activities for the older adults	Availability of activities for the older adults
	Number of activities	Many activities in the public space
		Few activities in the public space
	Number of surrounding businesses	Many businesses surrounding the public space
		Few businesses surrounding the public space
	Scale of surrounding buildings	Surrounded by tall buildings
		Surrounded by medium buildings
		Surrounded by small buildings
	Number of windows with a view to the public space	Surrounding buildings with windows
		Surrounding buildings without windows
	Evening activities	Evening activities in the public space

Source: Elaborated by the authors.

Figure 1.
Examples of manipulated images showing two conditioning levels of a variable.



Source: Authors.

A pre-test was administered to a limited sample of 15 participants. Feedback was given by the respondents on characteristics that caused confusion or were easily misunderstood. Some adjustments were made to the manipulated photographs and to the questions that would be eventually presented in the questionnaire, ensuring a clear representation of the variables.

Characteristics of the questionnaire

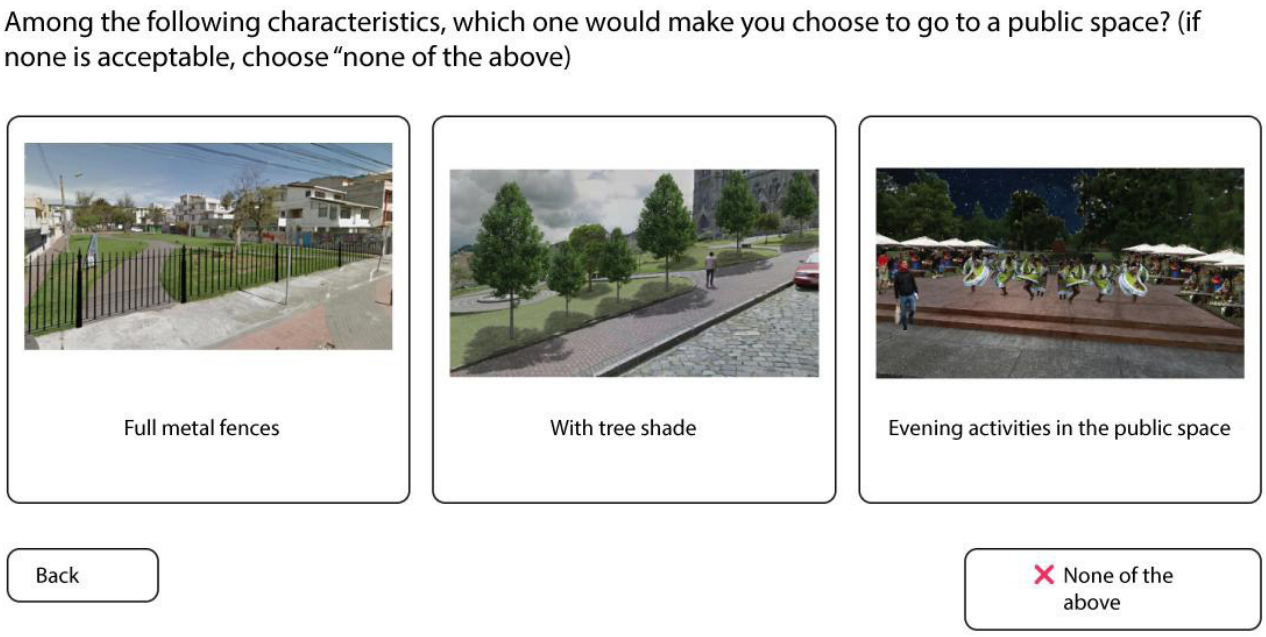
The web-based questionnaire had four sections: general participant questions, a DCE task on public space characteristics, user perception of public space characteristics and intangible qualities, and the connection between characteristics and public space typology. It was developed using web-based Conjoint.ly software

The survey initially collected participant information like age, gender, education, city, and income to understand their socioeconomic status.

The DCE section, with 12 multiple-choice questions, was the questionnaire's focal point. Participants chose the characteristic that would motivate them to visit a public space from three options, including "none of the above" (Figure 2). Each characteristic was shown with a manipulated photograph and a text description. Images were randomly selected by Conjoint.ly software.

Figure 2.

An example of a choice-based conjoint question providing options of characteristics for a given public space.

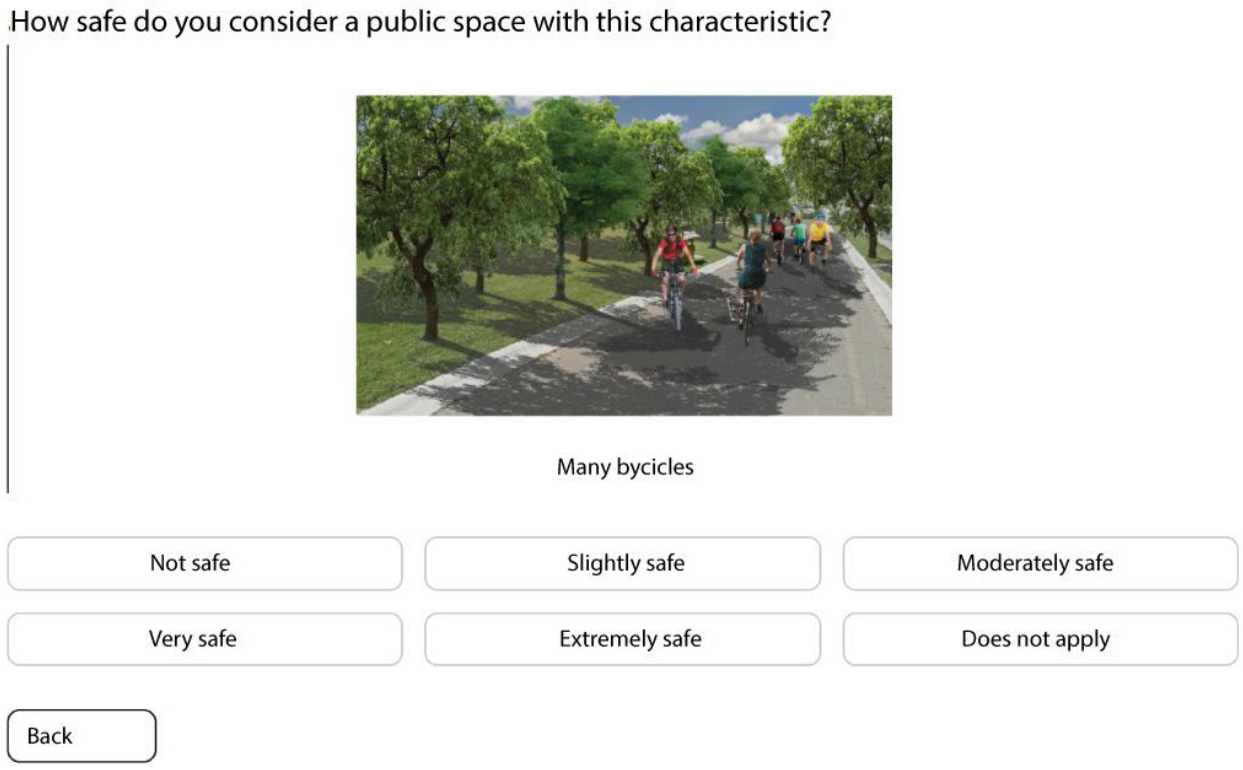


Source: Authors

Participants stated the relation between intangible qualities and conditioning levels. These qualities are related to attributes: Friendly/Welcoming with Encounter, Walkable/Accessible with Connections and Accesses, Safe with Comfort and Image, Active/Fun with Uses and Activities.

These questions aimed to determine if a POS characteristic could influence user perception. Participants ranked their agreement on a five-item Likert scale (Figure 3). The software randomly presented combinations of intangible qualities and public space characteristics.

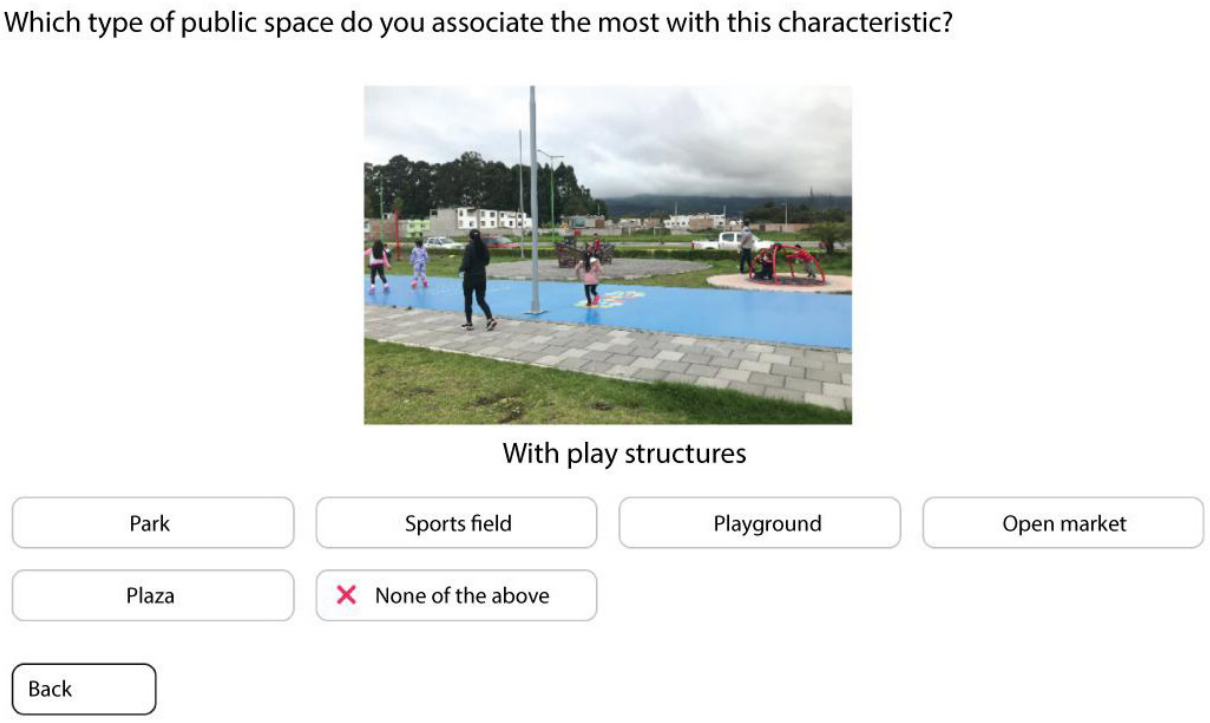
Figure 3.
An example of a question that associates intangible qualities and public space variables.



Source: Authors.

The last section asked participants to associate the variable with a specific public space typology: playground, plaza, park, open market, or sports field, based on Naranjo *et al.* (2020). The option "none of the above" was also available (Figure 4).

Figure 4.
An example of a question that associates public space variables and typologies.



Source: Authors.

Participants

The study sought responses from participants in Quito, Cuenca, and Ibarra, with a combined population of 2,305,956. Conjoint.ly required a minimum of 650 participants. Sample size was calculated considering MCMC HB method aspects like parameter complexity and model structure (Toni *et al.*, 2009) and effective sample size to mitigate autocorrelation effects (Du *et al.*, 2011). The questionnaire was distributed through various means, considering COVID-19 restrictions, including distribution lists from three universities, citizen groups, and a social-network campaign. A profile was created to invite participants from the three cities. The study aimed to expand its scope but recognized limitations regarding digital accessibility for certain groups.

At the beginning of the questionnaire, participants were informed about the study and the anonymity of the results. Contact information was provided in case there were any additional inquiries. The average duration of the test was 17 minutes.

864 responses were received. An exclusion criterion was established. Responses could be excluded if they met one or more of these conditions: time taken to respond was too short, choices were always in the same place on the screen, there was not enough scrolling through choices, or the participant lived in a city that was not a part of the study. The final number of valid responses was 758. Descriptive statistics of the participants are shown in Table 3.

Data Analysis

Descriptive statistics were calculated using Microsoft Excel and IBM SPSS statistics. The discrete choice experiment (DCE) analysis was performed using the Conjoint.ly software. The intangible qualities and typology sections also used the Conjoint.ly software for descriptive analyzes of multiple choice and brand association.

To evaluate the relative importance of each public space attribute, Markov Chain Monte Carlo Hierarchical Bayes (MCMC HB) is used by Conjoint.ly to calculate preference coefficients at an individual level within a wide-ranging hierarchical structure (Ghose & Yang, 2008; Gunawan *et al.,* 2020). The statistical assumptions underlying MCMC methods in Hierarchical Bayes modeling are a well-defined model structure, ensuring that the model adequately reflects the underlying processes being studied (Fitzgerald, 1991); convergence of the MCMC algorithm (Green, 2000); and careful consideration of prior distributions, where the selection of priors reflects the decision-making framework (Mansourian *et al.*, 2017). By using this method, it is possible to get an accurate representation of individual preferences within a hierarchical Bayesian framework (Jamrozik, 2004; Turner *et al.*, 2013), being suitable to provide insights into the unique preferences of POS users.

The experimental design relies on the use of attributes and conditioning levels to create a fractional factorial choice design. It creates several choice sets within blocks. Each participant is randomly assigned only one block. For this experiment, nine blocks of 12 sets each were established, covering the evaluation of all 49 alternatives.

By utilizing MCMC HB estimation, the software can calculate part-worth utilities and analyze preference coefficients at an individual level. Therefore, it can explain more efficiently the importance each individual factor has in a person's decision. It also allows to evaluate more parameters (variables and conditioning levels) with fewer data required from each participant. The calculation of part-worth utilities, also known as level scores, implies coefficients that show how much each alternative influences the decision in relation to other options for a product (a public space, in the case of this study).

Results

Demographics

Table 2.
Descriptive data of the participants (n=758)

Age (%)	Under 18	0,66
	18 to 25	22,3
	26 to 35	23,35
	36 to 45	24,01
	46 to 55	14,25
	56 to 65	11,87
	65 to 75	3,56
	Over 76	0
Gender (%)	Male	43,14
	Female	56,46
	Other	0,26
	I would rather not say	0,13
Monthly income (%)	Up to $400	12,01
	Between $400 and $800	16,09
	Between $800 and $1500	24,14
	Between $1500 and $2500	16,09
	Over $2500	12,53
	I would rather not say	19,13
City (%)	Quito	48,55
	Cuenca	35,62
	Ibarra	15,83
Highest level of formal education (%)	No formal education	0,13
	Elementary School	0,40
	High School	7,26
	Bachelor's Degree	48,94
	Master's or PhD Degree	43,27

Source: Elaborated by the authors.

The ages of the 758 (n=758) participants that were included and accepted present significant variations between the age ranges. Adults between 36 to 45 years have the highest percentages (24.01%), followed by adults between 26 to 35 years (23.35%) and adults between 18 and 25 years (22.3%). Most participants were female (56.46%) and the majority of the participants had a bachelor's degree (48.94%) followed by a master's degree (43.27%). The largest portion of people (24.14%) had a monthly income between $800 and $1,500. Almost half of the participants (48.55%) live in the city of Quito, whereas approximately one third of the participants (35.62%) live in the city of Cuenca, and the rest of participants live in the city of Ibarra (15.83%).

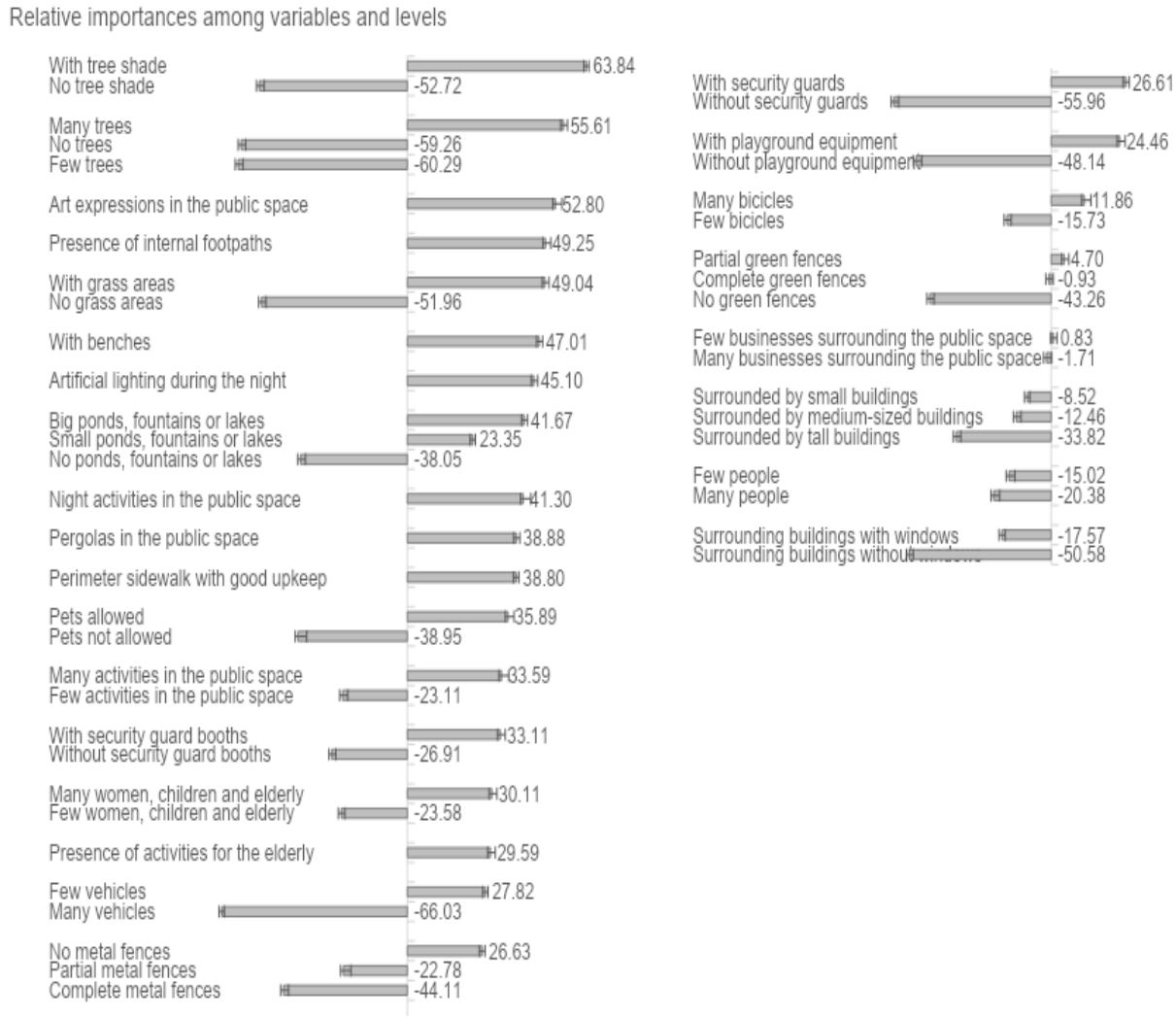
Relative significance of POS characteristics

The relative preference of the characteristics of public spaces represents the relative magnitude of the effect of each variable on the choice of visiting any of these spaces (Figure 5). Many of the characteristics have multilevel variables; this implies that they are measured under the relative preference scores for each conditioning level of each characteristic.

The highest scoring characteristic to choose a public open space is to have *shade of trees* (63.84; 95% CI = 62.97, 64.71). *The presence of many trees* is the second most important characteristic (55.61; 95% CI = 54.22, 57.11), while the third characteristic is the existence of *art expressions in the public space* (52.8; 95% CI = 50.53, 55.04). The presence of *pathways* is the fourth most important characteristic (49.25; 95% CI = 47.38, 51.06), and the existence of *grassed areas* (49.04; 95% CI = 47.64, 50.49) is the fifth.

The least important characteristic and, therefore, the least influential is the presence of *many vehicles* (-66.03; 95% CI = -66.88, -65.14) which represents the greatest difference with the next conditioning level of the variable: the presence of *few vehicles* (27.82; 95% CI = 26.89, 28.68). The next two least important characteristics are the existence of *very few trees* (-60.29; 95% CI = -62.16, -58.55) and the *lack of trees* (-59.26; 95% CI = -61.02, -57.59). The next two least influential characteristics when choosing a POS are the fact *it does not have security guards* (-55.96; 95% CI = -57.64, -54.29) and that there is *no shade of trees* (-52.72; 95% CI = -54.61, -51.08).

Figure 5.
Relative importance among variables and conditioning levels.



Source: Authors.

Comfort and image are the attributes present in the top quartile of variable preference, with four top variables; as well as uses and activities, with two; accessibility and connectivity with one; and sociability, also with one.

Among variables that have multiple conditioning levels, there are several whose results show significant differences between the alternatives they present. The first two variables with the conditioning levels of highest preference, *tree shade* (63.84) and *many trees* (55.61) show a difference of over 100 points compared to other conditioning levels inside each variable*: no tree shade* (-52.72), *no trees* (-59.26), and *few trees* (-60.29). Public spaces with *grass areas* (49.04) are strongly preferred over public spaces with *no grass areas* (-51.96). *Having big ponds, fountains, or lakes* (41.67) *or small ponds, fountains, or lakes* (23.35) ranked much higher than having *no ponds, fountains, or lakes* (-38.05). Also, many more people would prefer a public space where pets are allowed (35.89) over places where *pets are not allowed* (-38.95). Other multilevel variables showed results with smaller differences between their conditioning levels; all of them shown in Figure 5.

Participants were also requested to link variables with intangible qualities to describe their perceptions of various public space conditions. The intangible qualities included friendliness, walkability, safety, and vitality. Participants could rank a variable, or its conditioning levels, on a 5-point Likert Scale, for example, extremely walkable, very walkable, somehow walkable, slightly walkable, and not walkable. The two options of both ends (very or extremely and slightly or not) were added up, and the top 10% (highest five) scoring variables were obtained. These are presented in Table 3.

For most participants, a friendly public space would comprise *grass areas* and *tree shade;* a walkable public space would have *interior footpaths* and *perimeter walkways* in good condition; a safe public space would provide *activities for older adults* and *security guards;* and a vital public space would feature *grass areas* and *allow pets* in its premises.

Regarding the association that users make between a certain typology of POS space and the variables and conditioning levels proposed by the study, parks were associated with the *acceptance of pets* and the presence of *many trees*. Plazas were associated with *art expressions and evening activities*. A playground was associated with having *play structures* and *partial metal or green fences*. Sports fields were associated with *many bicycles* and *no ponds, fountains, or lakes*. Open markets were associated with *many businesses* and *many people*. The top quintile of variables associated with a typology of POS is shown in Table 5.

Table 3.
Top 10% of variables with positive and negative perceptions regarding intangible qualities.

Very or extremely friendly (%)		Slightly or not friendly (%)	
With grass areas	86,3	No trees	87,0
With tree shade	85,2	No grass areas	86,4
With benches	84,7	Many vehicles	80,2
Pets allowed	77,2	Few trees	73,8
Availability of activities for the older adults	75,3	Full metal fences	71,8
Very or extremely walkable (%)		Slightly or not walkable (%)	
Presence of interior footpaths	90,8	Many vehicles	73,2
Perimeter walkways in good condition	89,5	Full metal fences	69,0
With grass areas	80,3	Surrounding buildings without windows	39,4
With tree shade	78,7	Full green fences	38,2
Pets allowed	67,1	Many bicycles	37,5
Very or extremely safe (%)		Slightly or not safe (%)	
Availability of activities for the older adults	67,1	Without security guard booths	71,0
With security guards	66,2	Without security guards	63,4
With security guard booths	63,3	Surrounding buildings without windows	63,1
Many women, children, and older adult people	59,8	Many vehicles	62,8
With play structures	54,7	Few people	56,7
Very or extremely vital (%)		Slightly or not vital (%)	
With grass areas	78,7	No grass areas	86,5
Pets allowed	77,2	No trees	74,1
Art expression in the public space	73,9	Many vehicles	72,0
Many activities in the public space	68,9	No tree shade	67,6
With play structures	68,8	Few trees	67,2

Source: Elaborated by the authors.

Table 4.
Top quintile of variables associated with a typology of public space

Park (%)		Plaza (%)
Pets allowed	86,1	Art expressions in the public space
Many trees	76,5	Night activities in the public space
With tree shade	75,4	No grass areas
With grass areas	71,2	Surrounded by small buildings
Small ponds, fountains, or lakes	69,0	Surrounded by tall buildings
With benches	67,1	No tree shade
Big ponds, fountains, or lakes	66,2	Many businesses surrounding the public space
Presence of internal foot paths	60,5	Surrounded by medium-sized buildings
Many women, children, and older adults	57,6	Many people
No metal fences	55,4	Few people

Playground (%)		Sports field (%)
With playground equipment	64,1	Many bicycles
Partial metal fences	38,5	No ponds, fountains, or lakes
Partial green fences	36,6	No trees
Complete green fences	32,4	Few trees
Complete metal fences	29,6	Few women, children, and older adults
Many activities in the public space	24,3	Many activities in the public space
Many women, children, and older adults	22,8	Surrounding buildings without windows
Surrounding buildings with windows	18,9	Few bicycles
With grass areas	18,2	Few activities in the public space
Few vehicles	17,1	Complete metal fences

Park (%)	Plaza (%)
Open Market (%)	
Many businesses surrounding the public space	32,5
Many people	29,2
No grass areas	24,7
Many vehicles	19,8
No trees	16,5
Without playground equipment	15,9
No green fences	14,7
With security guard booths	13,9
Pets not allowed	12,3
With security guards	12,2

Source: Elaborated by the authors.

Discussion

The results portray a wide range of user preferences when choosing public open spaces based on their characteristics. Based on the top quartile of preference scores, it is possible to distinguish three main themes in which variables can be associated: natural characteristics (four variables), adequate amenities (five variables), and art expression and activities (four variables). This helps to better define how users choose public open spaces and why some are more successful at attracting visitors.

Table 5.
Main themes of the top quartile variables.

Presence of natural characteristics (rank)		Provision of adequate amenities (rank)		Activities and expressions (rank)	
With tree shade	1	Presence of interior footpaths	4	Art expression in the public space	3
Many trees	2	With benches	6	Evening activities in the public space	9
With grass areas	5	Artificial lighting during the night	7	Pets allowed	12
Big ponds, fountains, or lakes	8	Pergolas in the public space	10	Many activities in the public space	13
		Perimeter walkways in good condition	11		

Source: Elaborated by the authors.

These results concur with those found in other studies about user preferences regarding elements and characteristics of POS. A study about user preference on urban green space characteristics showed that the factors that most influenced the use of parks were "natural setting (visual quality), facilities, design, accessibility, location, water elements, safety, and maintenance" (Ahamad *et al.,* 2020, p. 42) coinciding with several of the main themes found in this study.

This study showed that the presence and shade of trees are the strongest preferences of the respondents for POS. This matches previous findings in the literature, for example, Adinolfi *et al.* (2014) found a significant correlation between the number of users and the number of trees in a park, while Rašković and Decker (2015) found that trees positively influence the willingness to visit and to stay in a public space. It is necessary to highlight the coherence in the responses to the questionnaire, as two of the least influential variables were the ones that mentioned an absence of trees. To emphasize on the importance of green elements, this study also showed a strong preference for grassed areas in POS, like Zhao *et al.* (2022), who found that trees, grass ground surface, and vertical green positively experience public spaces in a study of video-based stated preference experiments for neighborhood public spaces. Another important preference in this study was the presence of pathways in the POSs, congruent with Sugiyama *et al.* (2015), who found that the presence of walking paths, among other features, is associated with people walking to the POS. This evidence highlights the need for greenery in the design of POS, perhaps including civic squares, a typology in which green elements are often absent.

An unexpected result was the appraisal of art expressions in the public spaces, in line with Onesti (2017), who found that in the recovery of public spaces, integrating artworks in the street space is pivotal for the regeneration of places and of relationships between individuals using the space and the relation of the individual with the space itself.

Regarding low-ranking characteristics, the presence of many vehicles is one of the least preferred variables to find in public spaces. Authors like Tse *et al.* (2012) highlight that acoustic comfort is an important factor in a user's desire to remain in urban parks, with traffic being a major source of urban noise, therefore a potential deterrent for POS use. However, noise can be attenuated by different elements of park design, like tree groups, and noise is attenuated in the center of the park (Xing & Brimblecombe, 2020). Another low-ranking element was the absence of security guards. About the relation between safety and POS use, authors like Pérez-Tejera *et al.* (2022) found that lower POS use in Barcelona is related to incivilities and homelessness. Conversely, a study of Latin American cities found a lack of associations observed between perceived social disorder and park use (Moran *et al.*, 2020). As contradicting as the literature may be, it is necessary to consider that the perception of safety is profoundly context-dependent and subject to the levels of exposure that populations have. Irrespectively, if a population expresses safety as a concern, urban designers should focus on it. In relation to guards, a study from Sweden found that the presence of uniforms did not increase the feelings of safety in a situation perceived as relatively safe, making patrolling unnecessary. In situations perceived as relatively unsafe, however, all kinds of uniformed presence increased feelings of safety (Doyle *et al*., 2016). This evidence gives light to the fact that different strategies can be applied to increase the perception of safety in POS, from active vigilance (security guards) to passive design strategies for intervisibility between different points of the POS and lighting. These strategies should be analyzed and determined according to context.

Finally, other characteristics of importance for the respondents that were confirmed by the literature were the presence of water bodies (Li *et al*., 2022); an abundance of activities, including night activities (Mak & Jim, 2019); pet-friendly spaces (Özgüner, 2011); and unfenced spaces (Biernacka *et al.*, 2020).

Assets and limitations

This study aimed to explore a diverse set of factors and aspects related to a public open space. Using a web-based questionnaire reduced the need for technicians and made it possible to implement it during the COVID-19 lockdown. Similarly, respondents could express their preferences for diverse POS typologies, which would not be workable in a non-virtual experiment tied to a specific location. Nevertheless, there are limitations associated with this type of experiment and the context in which it took place.

The main limitation of this study was the underrepresentation of certain social groups, probably because of the challenges the digital gap imposes on certain parts of society concerning unequal access and participation using virtual channels. There were underrepresented groups regarding age, income, and education, so it does not reflect the reality of the general population of the three cities.

Finally, the virtual nature of the experiment imposed a limitation on considering other factors that could influence the perception of respondents, such as odors, noise, or having a broader and more immersive experience of a POS.

Conclusions

This study aimed to identify the POS characteristics that residents of Ecuadorian cities prefer, with the purpose of understanding the key factors that attract citizens to visit it. Also, if there is a connection between the typologies of public open spaces and any of its characteristics, and if a connection exists between the intangible qualities of public spaces and any of its characteristics. The study used manipulated photographs in a discrete choice experiment, showing that it could be a useful method for understanding user preferences regarding public open space characteristics. This information could be complemented and confirmed by contrasting it with the results obtained in field studies.

One of the main findings of this study is that characteristics related to the presence of vegetation and wooded areas are the most influential when deciding to visit a POS, followed by the amenities provided and the range of activities available for users. The study has also shown that POS should be designed with personal and road safety in mind.

The preferences of potential users of POSs are crucial for municipalities, decision-makers, and urban planners in Quito, Cuenca, and Ibarra to improve and implement new public spaces. When making improvements or creating new POS, it is crucial to prioritize green spaces because people highly value trees, grass, and bodies of water. Furthermore, adequate amenities and sufficient activities for the users can encourage people to visit POS. Any city aiming to provide their inhabitants with spaces that enhance their quality of life should take public open spaces into account.

A possibility to deepen in this line of research would be to conduct natural experiments that could contrast these results with field observations. One of these studies could attempt to reveal if the conditions of the most influential variables of this study may be predictors of the number of park users or user satisfaction in certain public open spaces.

The authors hope that this work contributes to the knowledge that informs public policies, decision-makers, and practitioners in charge of providing POS in cities and towns in a way that their characteristics reflect the preferences and aspirations of the population.

Article data

Dataset available at https://doi.org/10.34691/UCHILE/IRMLMD

Authorship Statement

Jorge Javier Andrade Benítez: Conceptualization, methodology, formal analysis, validation, investigation, data curation, writing – original draft, writing – review & editing.

María Laura Guerrero Valarezo: Conceptualization, methodology, formal analysis, validation, investigation, writing – original draft, writing – review & editing

Mónica Gabriela Naranjo Serrano: Conceptualization, validation, investigation, writing – original draft, writing – review & editing, project administration, supervision.

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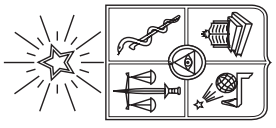

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