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Soundscape analysis during the flexibilisation phase of restrictions measures to contain the COVID-19 pandemic in urban parks in Curitiba – Paraná.

Karoline Farias Koloszuki Maciel
Master, UFPR, Brazil.
engkoloszuk@hotmail.com

Margret Sibylle Engel
PhD, University of Salford, United Kingdom.
m.engel@salford.ac.uk

Paulo Henrique Trombetta Zannin
Professor, UFPR, Brazil.
paulo.zannin@gmail.com

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ABSTRACT

The present study aims to characterise the soundscape of two parks in Curitiba (Bacacheri Park and Botanical Garden), along with a relaxation phase of sanitary containment measures of the SARS-CoV-2 (COVID-19) pandemic, during the year 2021. The authors collected subjective data from 200 participants (100 in each park) about perceived sound sources, sound annoyance generated by specific sources, functionality and familiarity of the parks, demographic data, and motivation for using the parks. The equivalent sound pressure levels were monitored over 15 minutes at various spots inside parks. Subjective data were analysed using the IBM SPSS 27® statistical software, and a Two-step Cluster Analysis was adopted. The cluster analysis results satisfactorily demonstrated the soundscape characterisation of the investigated parks. Such results showed that users are not bothered by the sounds of the region in Bacacheri Park and are slightly or moderately bothered by traffic sounds in the Botanical Garden. It was possible to verify the profile of the parks' users. Most women aged 18-35 have higher education and live near the parks. At Bacacheri Park, users mentioned that one of the motivations for using the park was "a safe place to relax in times of a pandemic".

KEYWORDS: Soundscape. COVID-19 pandemic. Cluster Analysis.

1. INTRODUCTION

Nowadays, noise pollution is present in several environments, and it is considered a severe problem in cities in developing countries, mainly caused by traffic (HIRASHIMA, 2014; BRÜEL & KJAER, 2021). Compared to other environmental problems, noise pollution continues to grow, accompanied by an increasing number of complaints and adverse effects on affected individuals (BRESSANE et al., 2016; ÖHRSTRÖM et al., 2006; SCHWELA, 2021). Therefore, one of the biggest challenges for cities today is the harmonisation between urban development and the conservation of existing natural resources, as their imbalance can cause negative impacts. In this context, urban green areas can play an essential role in the population's quality of life and improve the urban environment in many ways (JÚNIOR et al., 2018).

Among green areas, urban parks are considered essential public areas for sustainable urban environments (JASZCZAK; POCHODYŁA, 2021). Urban parks represent a necessary element of modern cities and are increasingly present in research from various disciplines, such as urban planning and design, environmental psychology, sociology, and acoustics (CHIESURA, 2004; YANG; KANG, 2005; BRAMBILLA; MAFFEI, 2006; THOMPSON et al., 2016). It is gradually perceived that the management of the sound environment of urban parks should also be addressed through a soundscape methodology instead of a common noise control methodology (ALETTA; KANG, 2015). The term soundscape originates from the landscape, created by Murray Schafer, defined as any field of acoustic study (SCHAFER, 2001). In environmental acoustics research, the term “soundscape” is the acoustic environment of a place, perceived or experienced by people in their context, resulting from the action and interaction of natural and/or human factors (ISO 12913-1, 2014).

The urban soundscape gained prominence with the pandemic caused by the Coronavirus (COVID-19), and traffic sound was drastically reduced with restrictions on urban mobility (ASENSIO et al., 2020; DROUMEVA, 2021). The SARS-CoV-2 virus (COVID-19) pandemic emerged in late 2019 as a mysterious disease in Wuhan, China. Coronavirus infection was recognised as a global pandemic by the WHO on March 11, 2020. Due to its high potential for contagion through interpersonal contact, social distancing was adopted as a measure to reduce the speed of transmission; with this, most human outdoor activities were drastically reduced,

preventing people from getting together and dislocation on city streets (GEVÚ et al., 2021). Implementing distancing measures and facilitating the movement of people on the roads resulted in broad social and environmental implications; among the environmental impacts is the decrease in urban sound levels, verified through comparative noise mappings before and during the pandemic (ALETTA et al., 2020).

The impact on the transport system, resulting in the decrease of vehicles on the streets, has also changed the sonic landscape, with the means of transport being the most significant contributor to urban noise (OUIS D., 2001; EEA, 2010). Therefore, this is the ideal time to reflect and give attention to new models for studying urban sounds. A barrier to this is the disconnection between soundscape literature, public engagement with sound and urban planning. (DROUMEVA, 2021).

2. AIMS

The present study aims to characterise the soundscape through clusters formed from the responses of sound perception on sound annoyance, perception of sound sources, functionality and familiarity with the place, motivation to frequent the parks, in addition to the socio-demographic profile of the visitors of two urban parks in Curitiba/PR.

3. METHODOLOGY

3.1 Study Areas

The study was carried out in urban parks, *Botanical Garden* and General Iberê de Mattos Park (*Bacacheri*), which are in the capital of the state of Paraná, Curitiba (Figure 1). According to the Brazilian Institute of Geography and Statistics (IBGE, 2022), the city of Curitiba has an area of 434.892 km², and the estimated population in 2021 is approximately 1.9 million people, with one of the best rates of green spaces in the country, 52 square meters per inhabitant, totalling about 82 million m².

Curitiba has 30 parks and forests (PMC, 2021), making it impossible to collect data in all green areas. Therefore, two parks in the city were chosen. *Botanical Garden* is located very close to roads with heavy vehicle traffic and is close to a railway. *Bacacheri Park* is located further away from roads with heavy traffic, but it is close to a small airport; even so, the region is quieter.

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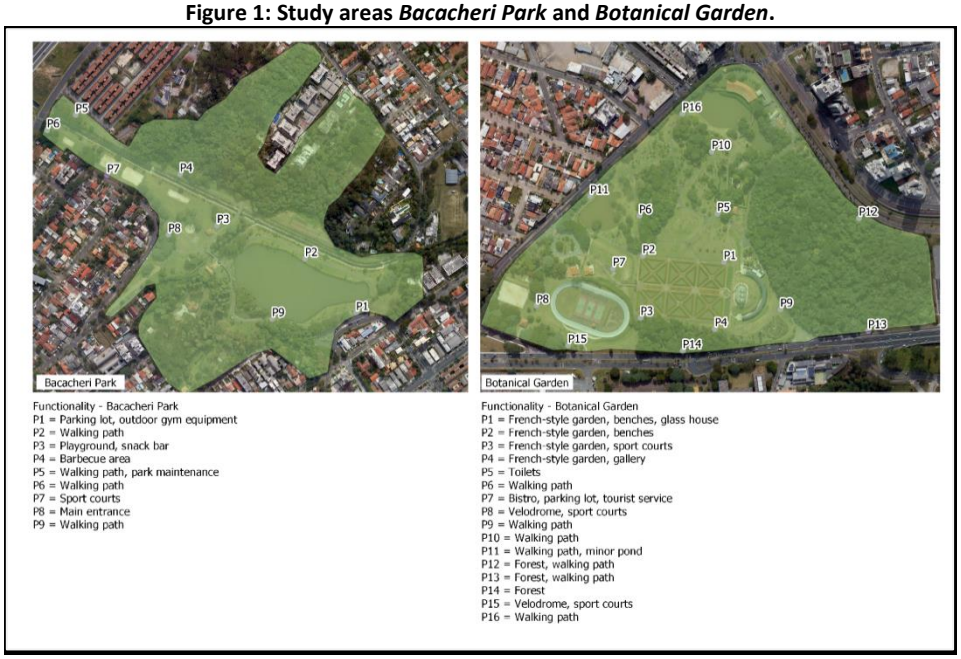
Figure 1: Study areas *Bacacheri Park* and *Botanical Garden*.



Source: Satellite images Map data @2022 Google.

3.2 Evaluation period

The interviews were carried out in July, August, and September 2021, on weekdays, between 2 pm and 5 pm, during the relaxation phase of measures to contain the COVID-19 pandemic. Based on weekly municipal decrees on sanitary measures from the municipality of Curitiba, it was possible to verify which restrictive measures in force could affect the movement and agglomeration of people in public places, helping to demonstrate the environmental impacts caused by such restrictive actions.

The list of municipal decrees in force in the period of subjective data collection can be seen in Table 1, and which restriction "flag" is indicated in each rule. The data collection day and the park where the data collection took place were also shown. It is possible to observe that all data collection takes place during the "yellow flag" period, with more lenient restrictive measures.

Table 1: List of municipal decrees in force during subjective data collection.

Data collection date	Park	Municipal decree	Flag
09.07.2021	Bacacheri Park	no. 1130 (DOE 131 -07.07.2021)	Yellow
12.07.2021	Bacacheri Park	no.1130 (DOE 131 - 07.07.2021)	Yellow
02.08.2021	Botanical Garden	no. 1210 (DOE 146 -28.07.2021)	Yellow
03.08.2021	Botanical Garden	no. 1210 (DOE 146 -28.07.2021)	Yellow
05.08.2021	Bacacheri Park	no. 1210 (DOE 146 -28.07.2021)	Yellow
06.08.2021	Botanical Garden	no. 1210 (DOE 146 -28.07.2021)	Yellow
01.09.2021	Bacacheri Park	no. 1210 & no. 1420 (DOE 171 - 01.09.2021)	Yellow
08.09.2021	Bacacheri Park	no. 1210 & no. 1420 (DOE 171 - 01.09.2021)	Yellow
22.09.2021	Botanical Garden	no. 1210 & no. 1420 (DOE 183 - 22.09.2021)	Yellow
23.09.2021	Botanical Garden	no. 1210 & no. 1550 (DOE 183 - 22.09.2021)	Yellow
24.09.2021	Bacacheri Park	no. 1210 & no. 1550 (DOE 183 - 22.09.2021)	Yellow
27.09.2021	Botanical Garden	no. 1210 & no. 1550 (DOE 183 - 22.09.2021)	Yellow

3.3 Sound mesurements

The Brüel & Kjaer model 2238 sound level meter measured and processed the sound levels. The measurements were carried out according to the NBR 10151 (2019) standard on days without climatic interference (no rain and strong wind). The measurement time at each point was 15 minutes, based on other studies that performed acoustic measurements (BOND et al., 2018; PAIVA et al., 2019; ZANNIN et al., 2021; NASCIMENTO et al., 2021).

3.4 Participants

The participants of this research were residents of the city of Curitiba-Paraná who usually frequent urban parks. A non-probabilistic convenience sample was used, where 200 people were interviewed in total, 100 in each urban park. Respondents were over 18 years old and were inside the park. These participated in the study as long as they agreed to answer the questionnaire.

3.5 Subjective survey

First, a pilot survey was carried out, in the *Botanical Garden*, during the month of May 2021 to evaluate and improve the questionnaire and to determine the data collection method used in the research, considering the following factors:

- Receptiveness of the people interviewed (park goers) due to the situation during the research period (Covid-19 pandemic).

- Clarity and applicability of the questions, seeking to improve the questionnaire and cultural adaptation.

- Average time of approaching individuals and duration of interviews and consequently the number of samples collected during the determined period of the research (14:00-17:00);

- Use of mobile device with a QR Code to access the questionnaire.

The questionnaire applied in the pilot research used all the questions according to the study by Szeremeta (2012), being prepared online on the Google Forms platform, where a QR Code was generated, a bar code that can be accessed using the cell phone camera, this code is converted into a link to access the questionnaire, to facilitate the delivery of the questionnaire to park visitors.

Thirty-nine interviews were carried out over two days in the *Botanical Garden* by two interviewers. The interviews were carried out in two ways. The first used the QR Code feature, with access to the questionnaire on the mobile device itself and only in case of doubts the interviewee would contact the interviewer; the second form consisted of an interview carried out by the interviewer. The participant could choose how to provide the data. Despite the technological ease of the QR Code, many park users were not equipped with their mobile devices or had access to the internet. For this reason, interviews were adopted as a data collection procedure for the remaining study, keeping a safe distance between the interviewee and the interviewer.

This survey added and adapted some questions and answers to better understand the interviewees and the current situation. A question was added regarding the pandemic period, where the interviewee was asked if they frequented the park more often before the pandemic, and an answer was also added, in one of the reasons for attending the park, “a safe place to relax in times of crisis - pandemic". The answers “distance from home” and “distance from work” were also adapted to “closeness to home and proximity to work/university” in the question about motivation to go to the park. Therefore, in this study, we used a questionnaire based on the work of Szeremeta (2012) and adapted it to the scenario of the COVID-19 pandemic.

For this study, the following questions were used:

1) 1) *Sound sources* – During your visit, how often did you hear the following types of sounds? (Possible answers: never, rarely, often) from the following sound sources: (a) Human sounds (People talking, children playing, etc.); (b) Sounds of nature (The sound of the wind in the leaves of the trees, sounds coming from the water, birds singing, etc.); (c) Mechanical sounds (traffic sounds, aircrafts, machinery, etc.).

2) *Sound annoyance* – During your visit, how much were you bothered (a) by the following factors: (Possible answers: not bothered, a little, moderately, a lot, significantly) for the following factors: (a) Traffic sound; (b) Aircraft sound; (c) Train sound.

3) *Familiarity* – Before the pandemic, did you go to the park more often? (a) Yes, for security reasons I frequent less; (b) No, same frequency; (c) Other: _____.

4) *Familiarity* – On a typical day, when you come to the park, how long do you stay in the park: (a) < 15 minutes; (b) 15 to 30 minutes; (c) 30 to 60 minutes; (d) 1 to 2 hours; (e) 2 to 3 hours; (f) 3 to 5 hours; (g) > 5 hours.

5) *Motivation* – What are the reasons that make you visit this park? (a) proximity to home; (b) proximity to work/university; (c) park structure; (d) parking; (e) security; (f) safe place to relax in times of pandemic; (g) known persons who attend; (h) available services; (i) beauty of the location; (j) little pollution; (k) other: _____.

Demographic questions about gender, age group, education level and neighbourhood were also used.

3.6 Post-data processing

The post-data processing method adopted in this study was the use of binary or dichotomous dummy variables (qualitative variables), in order to help in the quantification of questions with multiple responses, such as the question about motivation to attend the park (question 5) (ALKHARUSI, 2012; ENGEL et al. 2020).

3.7 Statistical analysis

Statistical calculations were performed using the IBM SPSS 27® statistical software for each park separately. This study adopted the two-step Cluster Analysis “Two-Step Cluster

Analysis", a method developed and available in the statistical packages of the IBM SPSS software. This method has a pre-clustering step, followed by a hierarchical grouping. The method allows the grouping of cases and variables and allows the analysis of data of mixed, nominal, ordinal and interval data scales (GOWER, 1967).

The pre-cluster checks take place through a "cluster resource tree" indicating whether the current cluster should be merged with another or whether it should form a new cluster, based on the distance criterion (CHIU et al. 2001). The clustering step considers the pre-clusters subclusters, clustering the desired number of clusters. In this step, the hierarchical cluster used to merge clusters processes the data, ending the clustering in just one cluster that contains all similar cases (CHIU et al. 2001). This step allows for solving outliers, which are records that do not fit well in any cluster (ŞCHIOPU, 2010). The Silhouette measure of cohesion and separation makes it possible to verify the quality of clusters (SARDTEDT; MOOI, 2014). Additionally, it was also observed through the test that the quality of fit of the chi-square ($\chi 2$) was observed if the clusters were significant or randomly generated (COHEN, 1988).

Cluster analysis was based on the following variables: *Functionality* (the main functions being observed in the subjective data collection sites); *Sound sources* (sound perception responses to sound sources – question 1); *Sound discomfort* (sound perception responses – question 2); *Familiarity* (answers for frequency of use of parks in the pandemic – question 3 and frequency of daily use of parks – question 4). The set of variables mentioned above provided the strength and grouped the content of the formed clusters. *Demographic questions* (gender, age group, level of education and neighbourhood), as well as the question of motivation to use parks (question 5), were variables that classified, apart, park users who provided the perception responses and formed the clusters. Such variables are not considered in the calculation of the strength of the cluster, as they have significant variability, which can weaken the strength of the cluster. However, they helped to profile the park user who provided the soundscape perception responses.

4. RESULTS AND DISCUSSION

The equivalent sound pressure levels, for a measurement period of 15 minutes, ranged from 51.3 dB (A) to 64.5 dB (A) in *Bacacheri Park*. In the *Botanical Garden* levels ranged from 53.8 dB (A) to 70.6 dB (A).

As reported in subsection 3.7, the two-step Cluster Analysis formed clusters from variables with the following aspects: functionality, familiarity, sound source and sound annoyance. The cluster calculations resulted in the generation of two clusters for each park. Where Cluster 1 was the smallest in both parks, with 34 participants in *Bacacheri Park* and 39 in *Botanical Garden*. Cluster 2 featured 66 participants at *Bacacheri Park* and 61 at *Botanical Garden*. The ratios between the clusters showed values of 1.94 in *Bacacheri Park* and 1.56 in *Botanical Garden*, showing good proportions in cluster sizes. The Silhouette measure of cohesion and separation of *Bacacheri Park* was equivalent to 0.3, indicating the moderate quality of the clusters. In *Botanical Garden* this measure was equivalent to 0.2, also indicating the moderate quality of the clusters. The chi-square ($\chi 2$) goodness of fit tests indicated significant results for both parks, where in *Bacacheri Park* we have $\chi 2(1) = 10.240$, p-value <0.05

and in *Botanical Garden* $\chi 2(1) = 4.84$, p-value <0.05, showing that the clusters were not generated randomly.

In table 2, it is possible to observe the importance of the predictors considering the parameters of perception of the soundscape and demography together. It is observed that in both parks the most essential parameter is related to the evaluation of sound sources related to mechanical sounds (1.00). In *Bacacheri Park*, the other parameters were in the following order of importance: *Motivation* – a safe place to relax in times of pandemic (0.24), *Functionality* - evaluation point (0.23), *Familiarity* - length of stay (0.23), *Sound source* – sounds of nature (0.23), neighbourhood (0.21), *Sound annoyance* – traffic sound (0.20), *Motivation* – park structure (0.18), age group (0.11) and *Motivation* – safety. In *Botanical Garden*, the order of importance was presented as follows: *Sound source* - human sounds (0.46), *Functionality* - evaluation point (0.32), *Familiarity* - length of stay (0.22), *Motivation* - parking (0 .18), *Sound annoyance* – traffic sound (0.16) and aircraft (0.12), *Motivation* – proximity to work/university (0.11), level of education (0.11). The other parameters showed importance equal to or less than 0.10 (10%).

Table 2: Importance of predictors considering the parameters of soundscape perception and demographics together.

Predictor	Predictor Importance Bacacheri Park	Preditor Importance Botanical Garden
Functionality		
Evaluation spot	0.23	0.32
Familiarity		
Permanence period	0.23	0.22
The frequency of park use changed after the pandemic	0.08	0.03
Sound source		
Mechanical sounds	1.00	1.00
Nature sounds	0.23	0.03
Human sounds	0.04	0.46
Sound annoyance		
Traffic sound	0.2	0.16
Train sound	-	0.04
Aircraft sound	0.01	0.12
Gender	0.01	0.03
Categorised age	0.11	0.07
Education level	0.02	0.11
Neighbourhood	0.21	0.08
Reasons to visit the park:		
Proximity to home	0	0.01
Proximity to work/university	0.05	0.11
Park structure	0.18	0.06
Parking lot	0.08	0.18
Safety	0.10	0.03
A safe place to relax in times of pandemic	0.24	0
Known people who frequent	0.04	0.01
Available services	0.01	0.06
The beauty of the place	0.08	0.01
Little pollution	0.04	0.05
Other reasons	0.03	0.01

Table 3 shows the most significant frequencies of responses for each parameter used to generate the clusters in *Bacacheri Park* and *Botanical Garden*. The functionality aspect showed great diversity in all clusters. In *Bacacheri Park*, point P6 indicated in Cluster 1 is close to the main access to the park through Canada Road. In this place, users usually sit on the lawn to relax, and it is possible to observe several users riding skateboards and bicycles. Point P9, indicated in Cluster 2, is close to a secondary entrance to the park, with the presence of several elderly people, sitting on benches along the walking path. In *Botanical Garden*, point P2, indicated in Cluster 1, is in the region of the French-style garden, where several benches are arranged and close to the park's glass house. Point P8, observed in cluster 2, is close to the sports courts, velodrome, and an area for interaction with pets and it is also possible to observe users sitting on the lawn relaxing and having a picnic.

Regarding familiarity, it is observed that in clusters 1 and 2 of *Bacacheri Park*, as well as cluster 2 of *Botanical Garden*, the most frequent answer regarding the length of stay of users was from one to two hours during their stay in the park. Already Cluster 1 of *Botanical Garden* showed higher frequencies for the dwell time of two to three hours. In all clusters, the most frequent response regarding park uses during the pandemic indicated that users did not change their frequency of use of parks throughout the pandemic.

As for the perception of sound sources, it is observed that mechanical sounds are often perceived in the responses of cluster 1 of *Bacacheri Park* and cluster 2 of the *Botanical Garden*. However, these sounds are rarely perceived in the responses of cluster 2 of *Bacacheri Park* and cluster 1 of *Botanical Garden*. Nature sounds and human sounds are frequently perceived in the responses of all clusters in both parks. Regarding sound annoyance, it is observed that in *Bacacheri Park* the most frequent responses indicated that traffic sounds, trains and aircraft do not generate sound annoyance. In *Botanical Garden* traffic sounds were often classified as a moderate annoyance in cluster 1. In cluster 2 such sounds were often classified as generating slight annoyance. Sounds from trains and aircraft were frequently reported as non-annoying in both clusters.

In the study by Silva et al. (2021), the effects that the SARS-CoV-2/Covid-19 pandemic had on environmental noise in a community near Bacacheri airport in Curitiba/PR, which is located near the area of the present study (*Bacacheri Park*). To analyse the effects of the pandemic on local sounds, the results obtained in this study were compared with results obtained in 2016, when the pandemic did not yet exist.

Questionnaires sent electronically in the year 2021 were used for people who live and/or work in the vicinity of Bacacheri airport, and there was a noticeable drop in the number of noise complaints in the area and a lower number of people with problems such as irritability, pain headache and insomnia. These results can be attributed to the lower flow of vehicles due to the pandemic, and to the fact that air traffic sounds, previously one of the leading causes of acoustic discomfort in the region, have been drastically reduced. The results of the studies mentioned above corroborate the results observed in this study, wherein both park users often report not being bothered by the sounds generated in the regions studied.

The profiles of users who provided such answers are mainly composed of females with higher education, as observed in all clusters. In *Bacacheri Park*, users were more often between 18 and 23 years old (cluster 1) and 30 to 35 years old (cluster 2), and these users often lived in

Bacacheri (cluster 1) and Boa Vista (cluster 2). Already in the *Botanical Garden* users were more frequently observed aged 24 to 29 years (both clusters) and often lived in the neighbourhood of the *Botanical Garden* (cluster 1) and Cristo Rei (cluster 2).

These results suggest that the parks, when visited during the period (2-5 pm), are composed of young adults under 40. Other studies carried out in urban parks on weekdays in Brazil (SZEREMETA, 2012; SZEREMETA; ZANNIN, 2009; BOND et al., 2018) also showed that the predominant age group of park visitors was 18 to 40 years old. In studies conducted outside Brazil, Jon and Jeon (2020) evaluated the influence of human behavioural characteristics on the perception of the soundscape in three parks in Paris-France and interviewed participants aged between 20 and 31 years old, with a mean age of 25.2 years old.

Dadvand et al. (2016) evaluated the role of green areas in the health of adult visitors and residents of Barcelona-Spain, and 45.4% of respondents were aged between 18 and 45 years. Campbell et al. (2016) conducted a social assessment in an urban park in New York, United States, and 56.8% of respondents were adults aged 18 to 65 years, and only 5.6% were elderly over 65 years. With this, it can be observed through the survey of other studies the people whom most frequent urban parks are aged between 18 and 40 years, considering the different methodologies and study sites. These results, from the literature and this study, suggest the need for an increase in public policies so that the elderly will use these areas more for activities and leisure.

The high level of education of most park goers is also observed in other studies (SZEREMETA, 2012; BOND et al., 2018). These results demonstrate that the urban parks studied favour people with a high level of education, consequently, with greater purchasing power, as the socioeconomic level is positively associated with the level of education (COLLET, 2008). This information can also be justified by the location of the parks, considering that people of higher classes live in their vicinity since the real estate valuation of the regions surrounding these areas is high (SZEREMETA; ZANNIN, 2009).

The most frequent motivations reported in *Bacacheri Park* were “closeness to home”, “park structure”, “security”, “safe place to relax in times of pandemic”, “beauty of the place” and “low pollution” in both clusters, and “known people who frequent the park” in cluster 2. In *Botanical Garden*, the most reported motivations were “park structure”, “security”, “safe place to relax in times of pandemic”, “beauty of the place” and “low pollution” in both clusters. With this, we can conclude the importance of these urban green areas not only as a possibility to get away from the noise of cities and traffic but also, especially in the time of the Covid-19 pandemic, the importance for the physical and mental health of the urban population. These results correspond to the study by Chiesura (2004), where many of the interviewees reported the importance of green areas as a refuge away from the traffic, noise, and pollution of the city.

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Table 3: Greater frequencies of responses for each parameter used to generate clusters in Bacacheri Park and Botanical Garden.

Variables	Bacacheri Park (N =100)		Botanical Garden (N=100)	
	Cluster 1 n = 34 (34%)	Cluster 2 n = 66 (66%)	Cluster 1 n = 39 (39%)	Cluster 2 n = 61 (61%)
Soundscape parameters				
Functionality				
Evaluation spot	P6 (29.4%)	P9 (16.7%)	P2 (20.5%)	P8 (19.7%)
Familiarity				
Permanence period	1–2 hours (29.4%)	1–2 hours (68.2%)	2-3 hours (41%)	1–2 hours (36.1%)
The frequency of park use changed after the pandemic	No, same frequency (55.9%)	No, same frequency (48.5%)	No, same frequency (74.4%)	No, same frequency (57.4%)
Sound source				
Mechanical sounds	Frequently (82.4%)	Rarely (90.9%)	Rarely (64.1%)	Frequently (96.7%)
Nature sounds	Frequently (73.5%)	Frequently (98.5%)	Frequently (92.3%)	Frequently (86.9%)
Human sounds	Frequently (91.2%)	Frequently (80.3%)	Frequently (51.3%)	Frequently (91.8%)
Sound annoyance				
Traffic sound	Not bothered (35.3%)	Not bothered (75.8%)	Moderately (35.9%)	A little (31.1%)
Train sound	Not bothered (100%)	Not bothered (100%)	Not bothered (92.3%)	Not bothered (80.3%)
Aircraft sound	Not bothered (85.3%)	Not bothered (83.3%)	Not bothered (89.7%)	Not bothered (93.4%)
Perfil do usuário				
Gender	Female (50%)	Female (48%)	Female (61.5%)	Female (52.5%)
Categorised age	18-23 years (32.4%)	30-35 years (22.7%)	24-29 years (25.6%)	24-29 years (26.2%)
Education level	Complete higher education (58.8%)	Complete higher education (48.5%)	Complete higher education (56.4%)	Complete higher education (55.7%)
Neighbourhood	Bacacheri (29.4%)	Boa vista (24.2%)	Botanical Garden (15.4%)	Cristo Rei (18%)
Reasons to visit the park:				
Proximity to home	Yes (76.5%)	Yes (77.3%)	No (56.4%)	No (52.5%)
Proximity to work/university	No (100%)	No (93.9%)	No (89.7%)	No (72.1%)
Park structure	Yes (67.6%)	Yes (93.9%)	Yes (89.7%)	Yes (78.7%)
Parking lot	No (82.4%)	No (62.1%)	No (94.9%)	No (72.1%)
Security	Yes (50%)	Yes (74.2%)	Yes (61.5%)	Yes (68.9%)
A safe place to relax in times of pandemic	Yes (58.8%)	Yes (92.4%)	Yes (76.9%)	Yes (75.4%)
Known people who attend	Yes (55.9%)	No (59.1%)	No (61.5%)	No (59%)
Available services	No (76.5%)	No (71.2%)	No (71.8%)	No (83.6%)
The beauty of the place	Yes (85.3%)	Yes (97%)	Yes (92.3%)	Yes (93.4%)
Little pollution	Yes (73.5%)	Yes (84.8%)	Yes (82.1%)	Yes (72.1%)
Other reasons	No (88.2%)	No (93.9%)	No (97.4%)	No (98.4%)

5. CONCLUSIONS

The present study aimed to characterise the soundscape of two parks in Curitiba, *Bacacheri Park* and *Botanical Garden*, by clusters formed from the responses of sound perception on the perception of sound sources, sound annoyance, functionality, and familiarity with the place, in addition to the socio-demographic profile of users and motivation for the use of urban parks.

The methodology used in this study proved to be satisfactory, as it reached the proposed objective, where it characterised the socio-demographic profile of the users of the two parks, where most users are female, aged between 18 and 35 years, have education completed higher education, live in the local neighbourhood or nearby, and the reasons for attending the parks were, the beauty of the place, park structure, safety, places with little pollution and is a safe place to relax in times of pandemic.

Regarding the soundscape parameters, most users stay in the park for 1 - 2 hours and frequent the park at the same frequency, before the pandemic, most respondents from *Bacacheri Park* hear mechanical sounds rarely, and from *Botanical Garden* often, as the sounds of nature and human sounds, interviewees from both parks hear frequently. Most of the interviewees from *Bacacheri Park* do not feel bothered by the sounds of traffic, trains, and aircraft, whereas the interviewees from *Botanical Garden* feel slightly too moderately bothered by traffic sounds and not bothered by the sounds of trains and aircraft, a positive effect on the environmental impacts generated during the SARS-Covid19 pandemic. Such impacts positively influence the mental and, consequently, physical health of park users, especially in times of a pandemic, where mobility is restricted, and many places are closed, making it challenging to practice physical exercises and leisure.

6. REFERENCES

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