



Sounds and noises during a period of the COVID-19 pandemic in Brazil

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Abstract

The social distancing measures implemented by public managers due to the COVID-19 pandemic caused changes in the dynamics of cities, and consequently, in the noise environment. In this sense, this research aims to identify the predominant sounds and noises during a pandemic period in Brazil. In the social distancing context, the methodology consisted of digital tools in which an online survey questionnaire was designed and applied with 1,769 answers from the five regions of Brazil, from May to June 2020. The results show that the noise decreased for approximately half of the participants, both inside the building and in the surroundings. The sound perceptions in the lockdown period caused by the pandemic showed that new sounds were perceived, as sounds of nature and ambulance sirens. In addition, the main disturbing pandemic noises have been identified, such as vehicle noise and the sound of neighbours.

Keywords: soundscape; covid-19; sounds; noises.

1 Introduction

The social distance caused by the pandemic of the new coronavirus - COVID-19 (severe acute respiratory syndrome coronavirus 2 - SARSCoV-2) has caused changes in the dynamics of cities worldwide. The virus of pandemic range was initially documented in China and caused a global public health crisis, evidencing a

rapid spread and wide spectrum of severity [1]. On 30 January 2020, the World Health Organization (WHO) declared the outbreak of the novel coronavirus a public health emergency of international concern [2]. This statement was associated with several recommendations to prevent the spread of the virus, such as procedures of social distancing and isolation, closing establishments and public spaces and, in case of suspicious symptoms, quarantine.

From this perspective, investigations from various fields are being carried out to understand the changes in the dynamics of societies during the pandemic period [3; 4; 5; 6; 7; 8]. Architecture, urbanism and engineering, intended for studying the relationships between individuals and space, can support efforts to develop new knowledge about the impact of a pandemic on the built environment and consequently on society. Thus, the gap was identified in relation to the sound environment in Brazil during social isolation.

The actions to restrict the use of public and collective spaces caused the reduction of sound pressure levels (SPL) by reducing circulation, work and leisure. The watchword "stay at home" decreased the SPL of the cities and became evident in the human auditory perception of sounds previously masked by urban noise [9].

Urban noise has been reduced due to decrease in the flow of vehicles, closing of airports, leisure buildings, temples, schools, commercial establishments, etc. Thereby, people began to perceive different sounds in cities and specific sources, previously masked by traffic noise, as sounds of neighbours, construction works, children, birdsong, etc. The context of social isolation allowed different sound experiences in the cities. New habits and new routines of staying at home began to modify the acoustic needs for the dwelling, which became a place of work, school, children's play and also fun and rest.

With the reduction of vehicles in the city there was a phenomenon noticed in cities across the world, it was the presence of wild animals roaming the urban environment. For example, in April 2020, in the city of Santiago, Chile, several cougars were seen wandering the city streets [10]. Moreover, in Brazil, there was an increase in the appearance of wild animals in urban areas during the pandemic, such as foxes and anteaters in the streets of Vitória, Espírito Santo, in May 2020 [11].

Furthermore, the fauna in the city living with low noise levels began to be perceived more clearly by people, such as birdsong, as can be observed in reports presented on the Cities and Memory website [12]. However, according to Asensio *et al.* [13], it is difficult to specify whether the apparent increase in the perception of bird sounds in urban areas would be due to the presence closer to the source or it would be due to increased levels, or lack of noise masking, among other aspects.

Therefore, in this context of changes in the sound environment of cities during the pandemic, this research aims to analyse the sound perception of individuals during the period of social distancing caused by the COVID-19 pandemic in Brazil, during the period from May to June 2020. For this purpose, an online questionnaire was developed.

It is expected with this work to obtain possible contributions about the sound perception in the face of social isolation caused by the pandemic, both in architecture (building) as in the urban scale (city). And thereby contribute to the publications on the sound environment during the isolation period caused by the pandemic of COVID-19 in Brazil.

2 Method

2.1 Questionnaire Development

To prepare the questionnaire, three main facets were determined, they are: environmental, demographic data and noise perception (Figure 1). Objective multiple-choice questions were designed to investigate the relationships of individuals (respondents) with the noise environment during the pandemic period, caused by COVID-19. For this work, the variables demographic data and sound perception were explored.

The questionnaire was structured on the online platform Google Forms, aimed at the public aged over 18 years. This online base allows responses to be collected quickly, in addition to organizing the data for analysis. The online form was adopted as a viable tool for data collection during the period of social isolation. Besides offering technological facility to create with a simple interface also allows the distribution to the public.

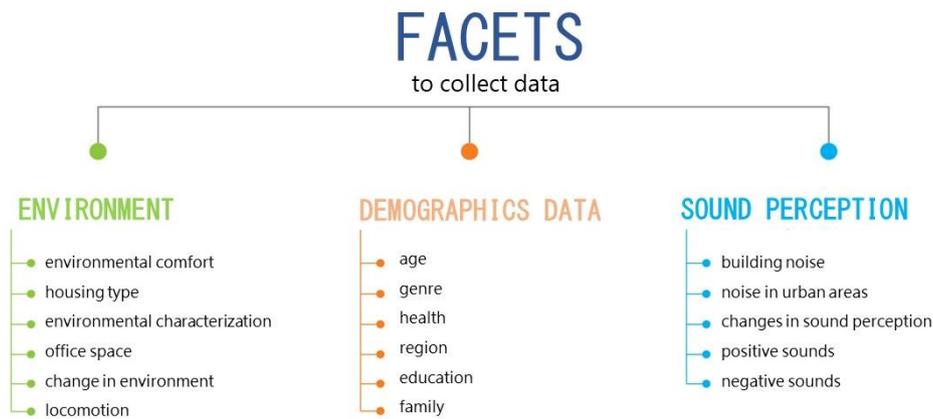


Figure 1 – Structure of the facets of the questionnaire applied. Authors, 2020.

2.2 Application of the questionnaire

The virtual questionnaire was available for responses during the period from 08 May to 08 June 2020. It was distributed through social networks, by the Brazilian Council of Architecture and Urbanism and by ProAcústica - Brazilian Association for Acoustic Quality. A total of 1,769 responses were collected.

2.3 Data treatment and analysis

Responses were systematized in Microsoft Excel software in an information database that enables the researcher to cross-check all available data. Adjustments were made in the data settings in Microsoft Excel software to calculate the percentages of respondents in each response category, as well as the average value of each assessment. The processing of the final database and all graphical analysis were performed in the Tableau software [15].

3 Analysis of results

3.1 Interviewee profile

The perception of the sound environment will depend on each individual's profile, because each one has its own cognitions, such as memories, ideas, feelings, attitudes, values, preferences, meanings, behaviours, experiences, etc. For this, the demographic data and characteristics of housing and office of the research participants will be presented. It was possible to define the profile of these participants, important for the analysis of the answers about sound perception.

Figure 2 presents the distribution of answers in the country, with the percentage of each State. The highest concentration of respondents came from the States of Alagoas and Santa Catarina (the States of origin of the researchers, to whom the questionnaire was initially spread), followed by São Paulo and Minas Gerais. The regions with the highest concentration of answers are distinct in socioeconomic context and climate. Only the State of Roraima did not submit responses to the questionnaire.

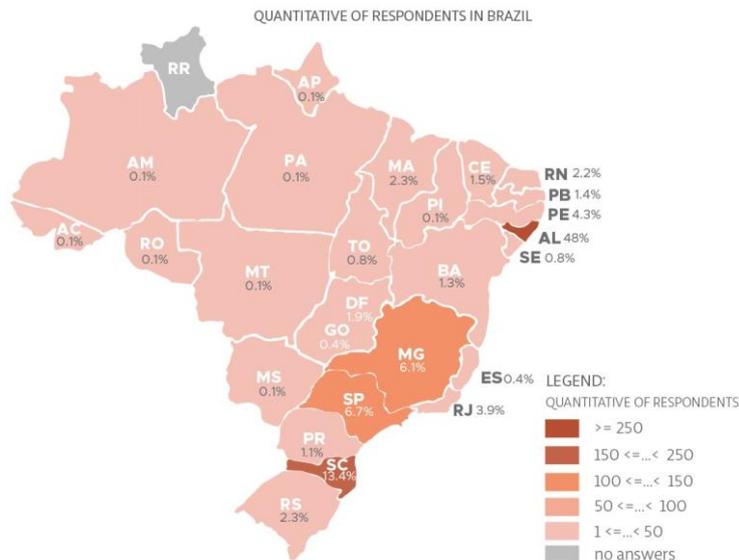


Figure 2 – Quantitative questionnaire responses by Brazilian state. Authors, 2020.

The profile of the respondents was characterized as mostly male, young people aged 18 to 39, university graduated, post graduated and teaching, education and professionals in the field of exact sciences. 96.6% of the participants do not present disabilities (see Figures 3 and 4). It is considered that this configured profile was a consequence of how the questionnaire was made available through emails, websites and institutional social networks.

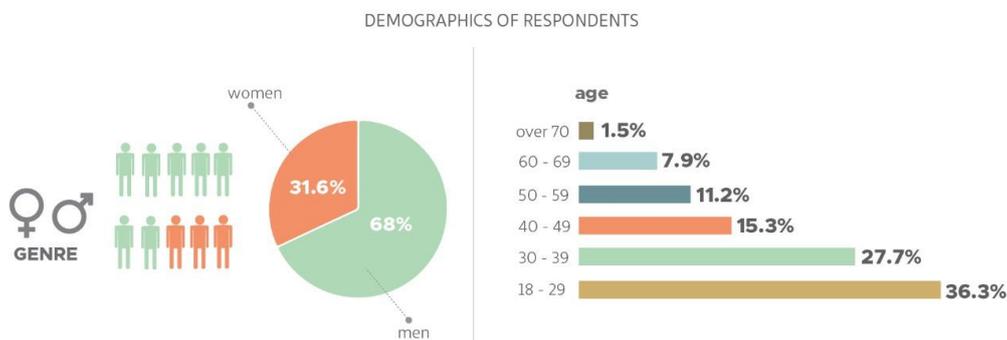


Figure 3 – Demographic data of gender and age of the respondents. Authors, 2020.

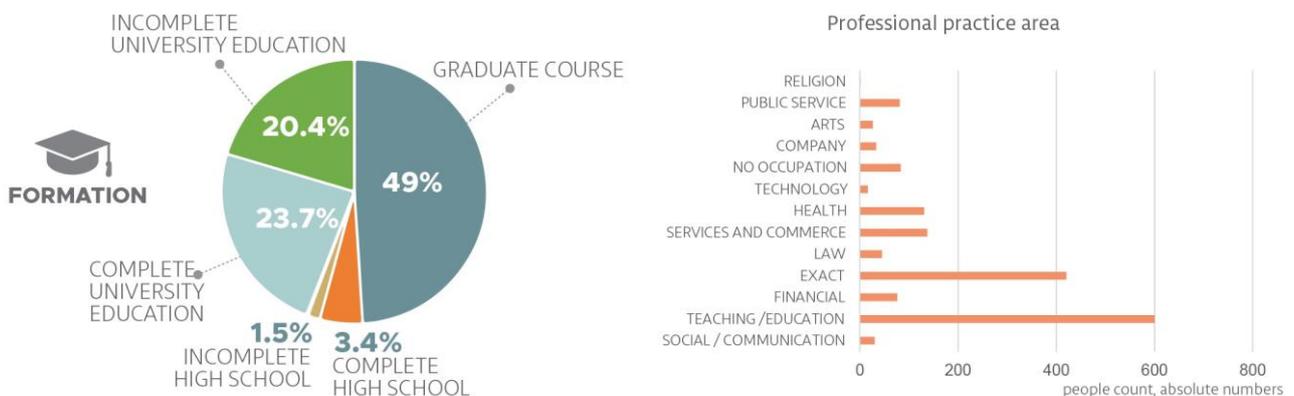


Figure 4 – Demographics data of disability and education, and respondents. Authors, 2020.

3.2 Sound perception - internal and external environment

In order to investigate the changes in the sound environment of the inhabited space, the question was: "During the pandemic of COVID-19, do you think the noise in the region where you live: *Decreased / No change / Increased*". In the statistical analysis, it is observed that more than half of the respondents (53.3%) stated that noise had decreased, a consequence of social distancing and reduced movement of people and urban transport (see Figure 5). 32.6% of answers reported that there was no change in the noise environment and only 14.1% of the answers pointed out the increase in noise.

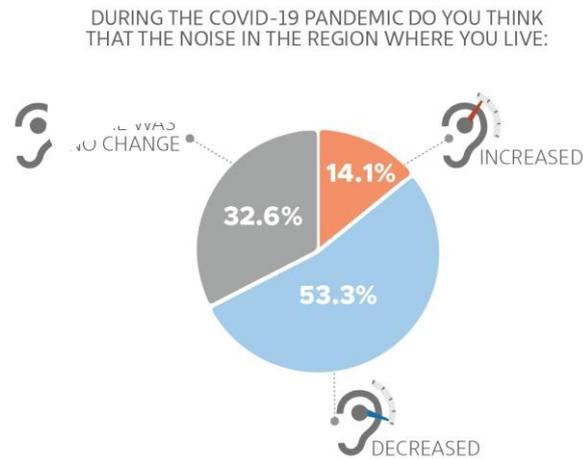


Figure 5 – During the pandemic of COVID-19, do you think the noise in the region where you live. Authors, 2020.

Figure 6 shows the distribution (on a Likert scale) of all responses on sound perception to discomfort inside the dwelling and in the surroundings. The average of the answers remained between 3.35 (in the building) and 3.13 (in the surroundings), which shows the tendency of the answers for the classification *Adequate*. However, most opinions were for *Adequate* and *Quiet*, with approximately 30% of the choices for each classification, both in the building and in the surroundings. With 65.5% of respondents were not disturbed by the noise inside the dwelling and 61.4% outside. The total of *Noisy* and *Very Noisy* opinions of sound perception reached 19.6% in the dwelling and 28.2% in the surrounding area, thus the greatest nuisance was attributed to the external noise.

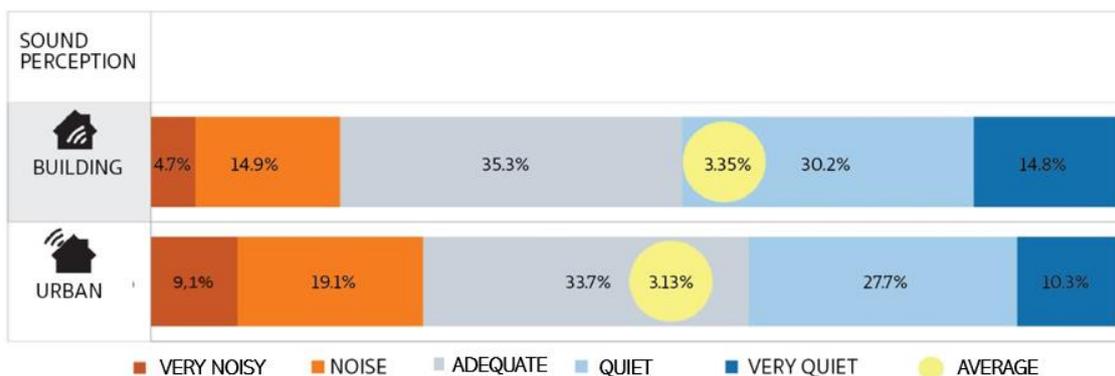


Figure 6 – Sound perception of the respondents related to noise nuisance, inside the building and surrounding the external environment. Authors, 2020.

3.3 New sounds perceived

When asked openly: "Are there sounds that you did not perceive before and have started to perceive now? Which ones?". As this question was open, the respondents could point to different groups of sounds and noises in a single answer. 36.9% answered positively to the new sounds perceived, which means a different city soundscape. 29.3% answered *no* and 33.9% did not answer. Of those who answered *yes*, a variety of responses appeared as new sounds perceived (Figure 7). Within these answers, the sounds most frequently stated were the sounds of nature, equivalent to 40% of the answers. In this category, the sounds of animals such as birds, the most frequently mentioned, crickets, cicadas, dogs, wind and water sounds, such as rain, sea waves and river currents began to be perceived. The answer "sounds from neighbours" predominated in the category human sounds, followed by "sounds from children". In the vehicle sounds type were mentioned cars, motorbikes and ambulance sirens. In others cases, noises from civil construction works and machines were cited.

The perceptions captured by this question are consistent with the dynamics established in the cities during the period of social isolation: the reduction of movement attenuated the road noises and highlighted the sounds of nature; staying at home accentuated the perception of human sounds, such as the sounds of neighbours; among the sounds of vehicles mentioned, the presence of ambulance sirens was noted, which signalled the chaos in the health system.

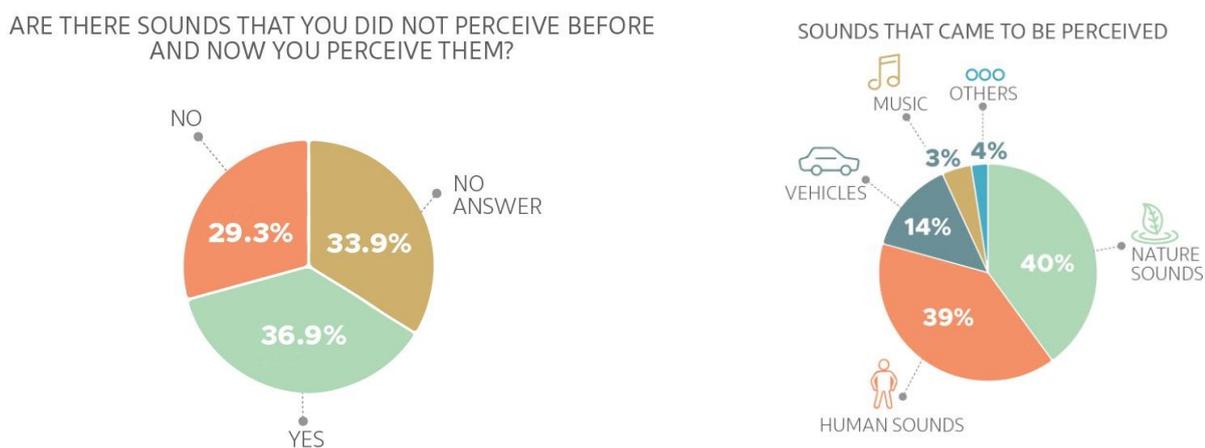


Figure 7 – Sounds that began to be perceived by respondents. Authors, 2020.

3.4 Noises in the Pandemic

In a short period of time, the house with confined residents kept sophisticated acoustic demands, such as video recording, the flexibility of spaces, video conferences (often with several people in the house in different places at the same time) besides the routine demands living in the same space at the same time. As the demands have changed, the acoustic requirements have also changed. What was not uncomfortable before, became a problem.

In the question "What is the most disturbing noise in your home?", the automobile noise was predominant with 42% of the answers (Figure 8), from the vehicle sounds, the sounds of ambulances were mentioned. Even with the considerable decrease in automobile traffic in cities, this noise still became the most mentioned in the answers. The noise from human sounds as neighbourhood was perceived by 29%, confirming what has been reported in articles and news, for example the number of conflicts between residents of residential condominiums increased noise complaints became frequent during the pandemic [16; 17]. Such problematic occurred in Goiânia, capital of Goiás, where noise pollution complaints from residences, during the months of March, April and May 2020, increased by 199%, if compared to the same period of the year in 2019, according to data provided by the Municipal Environment Agency [18].

16% of the respondents complained about noises from electronic sounds such as stereos. Urban noises from commercial establishments accounted for 6% of the responses, bars, restaurants, and churches were cited. This shows that, even at times of greater isolation, such as at the time of the questionnaire data survey (May and June 2020), there was the movement of people in establishments considered to be non-essential.

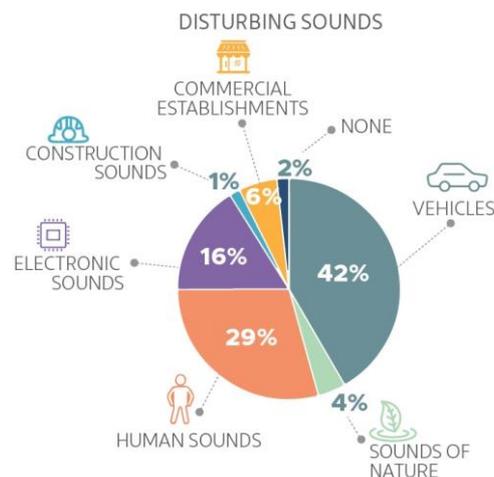


Figure 8 – Sounds that annoy respondents during the research period. Authors, 2020.

4 Conclusions

This study presented data collected on the perception of the sound environment during the COVID-19 pandemic period in Brazil, collected by an online questionnaire applied between May and June 2020. The sound perception of most participants showed that noise had decreased, this due to the attenuation of movement of people and transport in cities, caused by social distancing.

From the sound perception of the environment, it can be established that most of the respondents were not disturbed by the noise inside and outside, as the opinions described these environments as *Adequate* and *Quiet*, on the rating scale from *Very Noisy* to *Very Quiet*.

In general, when analysing the averages values, the answers regarding sound perception were more positive inside the building than in the surroundings. One of the reasons may be that external sound sources may cause more disturbance as they are noisy and difficult to control. However, both answers were predominant in *Adequate* and *Quiet*. The perceptions of the sound environment showed that new sounds were perceived, such as nature sounds and ambulance sirens. The main disturbing noise was the neighbourhood sounds. From this study, a survey of the sound environment in Brazil during a period of confinement caused by the pandemic is made from the sound perception of the participants.

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