Using the Sonic Perception to Improve Public Spaces and Develop a Place Identity

Christina E. Mediastika, Anugrah S. Sudarsono, and Luciana Kristanto

Abstract

A city ideally possesses a unique identity that differs it to others, so both dwellers and visitors are easy to identify places. Features in the city that made it unique shall also be friendly to inclusive users, including those with special needs. It is easily spotted in the cities of emerging countries that people with special needs are hardly accommodated. Visually impaired people, as the most vulnerable community in urban areas, need safe and comfortable accesses to do the activity independently. As the visually impaired people mostly depend on sound and tactile, a series of study using a soundscape method in public areas and public facilities was performed. The objective was to map the most prominent sonic dimension of these people, which provides guidance, safety, and comfortable acoustic environment for them. The data were collected using an off-site and *in situ* method, i.e., at parks, on footpaths, and in shopping malls. The principal component analysis (PCA) was run to extract the data. On the paths and in shopping malls, the soundscape dimensions of the visually impaired is more or less similar to the sighted, where the dimension of pleasantness is the most prominent. At parks, the visually impaired perceived eventfulness soundscape dimension as the most important. The finding is recommended to improve public spaces in the urban areas, which later may also be valuable to develop the place identity using sonic features.

Keywords

Sonic perception • Soundscape dimension • Public spaces • Sighted people • Visually impaired people • Sonic city identity

1 Introduction

The extensive use of technologies and buildings style toward modernism has created similar cities that nearly lost their unique identity. Place identity was defined as "the extent to which a person can recognize or recall a place as being distinct from other places" (Lynch 1960). By this definition, we associate place identity is something evident and visible at first sight. Thus, the eyes are the first sense to recognize a place. The image of the place is composed of the view of urban elements such as monumental buildings, public spaces and other special features (Riza et al. 2012). Most cities or places are identified visually. However, it is possible also to identify the specific features of a city or place using objects within the city that create sound. Hellström (2002) has stipulated how cities can be identified as sonically. Whereas Elmqvist and Pontén (2013) said that "each city may have a unique acoustic profile, the composition of specific natural sounds, signals and noise."

A method to appraise the acoustic environment of a place is called soundscape, at which people listen to the surrounding sound and state their perception toward the sound. The International Standardization Organisation defines soundscape as an acoustic environment as perceived or experienced and or understood by people; in context (ISO 2014). The project that is reported here, using a soundscape method to map the sonic perception of people in public spaces of cities of an emerging country. Parks, shopping malls, and footpaths in Surabaya and Yogyakarta, Indonesia, are the public spaces selected for the study. The types of public places were selected based on the number of urban community to spend

C. E. Mediastika (✉) · L. Kristanto
Department of Architecture, Petra Christian University, Surabaya, Indonesia
e-mail: eviutami@petra.ac.id

A. S. Sudarsono
Kelompok Keahlian Fisika Bangunan, Institut Teknologi Bandung, Bandung, Indonesia

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their spare time for relaxation. In Surabaya, parks and shopping malls are two favourite places for spending leisure time, and footpaths are the most prominent access for those using public transport to reach these two spots. Whereas in Yogyakarta, footpaths and shopping malls are the two most visited places for leisure time. There is a primary footpath in the city centre of Yogyakarta, namely Malioboro, which is used frequently for art performances.

The study reported here is unique since to date soundscape method to study public spaces were all conducted by sighted people (Axelsson et al. 2010; Kang and Zhang 2010; Brambilla et al. 2013; Filipan et al. 2014; Aletta et al. 2016). Those studies extracted soundscape dimensions of public places which differs to soundscape dimensions by visually impaired people (Mediastika et al. 2020). The soundscape of visually impaired people varies not only in its dimension as compared to that of the sighted but also differs according to the local context (Jeon et al. 2018; Mediastika et al. 2020). Visually impaired people were invited to participate in the study as they are more sensitive to sound than the normal-sighted people (González-Mora et al. 1999; Mediastika et al. 2019), they are also typically able to process acoustic information better (Lessard et al. 1998) and that they are considered the most vulnerable group in the urban community. Inviting visually impaired people for the study is hoped to elicit a conclusion from the perspective of these people, which is beneficial for policymakers and urban designers to improve the city to be more empathic. A successful empathic design should involve the perspective of those with special needs in the design (Mediastika 2016).

2 Aim of the Study

The study is aimed to map the most prominent and specific sonic dimension appreciated by visually impaired people, which provides guidance, safety, and comfortable acoustic environment for them.

3 Methods

The study was conducted empirical both off-site and *in-situ* with sighted and visually impaired participants. The off-site method was performed to gather preliminary information of the participants' sonic memory of certain places. The data collected from the off-site survey, which was in a focused group discussion method, was used to construct the questionnaire for the *in-situ* surveys.

4 The Parks

Surabaya is the second-largest city in Indonesia after the capital city; Jakarta. Surabaya has developed more parks with better quality in comparison to other cities in Indonesia. Therefore, other cities always refers to Surabaya in the attempt of providing good urban parks. To date, there is no Indonesia cities has developed parks as massively as Surabaya. Thus, a survey only in Surabaya is considered a sufficient representation of a study about the sonic ambience of parks. Two of the largest, the most iconic, and the most visited parks in Surabaya, namely Taman Bungkul or Bungkul Park and Taman Flora or Flora Park, were selected for the study. With areas of 9000 m^2 (Bungkul, Fig. 1a) and 30,000 m^2 (Flora, Fig. 1b) only, they are considered the largest in Surabaya. Both parks are located within the city centre and are easy to access by city dwellers. For the soundscape survey, Bungkul Park was grouped into 5 routes and spots and Flora Park into 3 routes and spots. Bungkul has more spots to be surveyed due to more variety features in Bungkul Park than in Flora Park.

5 The Shopping Malls

Being the second-largest city and the centre of economic and business activity of the eastern part of Indonesia, many large shopping malls are located in Surabaya. The oldest one and the most iconic is Tunjungan Plaza, which was selected for the study. Besides Tunjungan Plaza, Grand City Mall in Surabaya that declares as a disabled-friendly mall and Malioboro Mall in Yogyakarta were also selected for the study. Both Tunjungan Plaza and Malioboro Mall are located precisely in the city centre of Surabaya and Yogyakarta, respectively. Tunjungan Plaza was opened for public in 1986 (Fig. 2a). It is now the second-largest shopping mall in Surabaya with retail areas of 150.000 m^2 and more than 500 tenants. Whereas Grand City Mall is a medium-size mall located in the heart of Surabaya (Fig. 2b). It was opened for public in 2009. Malioboro Mall (Fig. 2c) is also the oldest and the most iconic mall in Yogyakarta located alongside the most famous street in the city, namely Malioboro. It was opened for public in 1993 and had significantly smaller retail areas compared to the shopping malls as mentioned earlier. It is also located just by the primary footpath of the city, where art performances are frequently held. Each shopping malls were grouped into four routes and spots for the survey.

Fig. 1 **a** Aerial view of Bungkul Park and **b** Flora Park (after https://www.google.co.id/maps/)

Fig. 2 **a** Interior views of Tunjungan Plaza and **b** Grand City Plaza, Surabaya, and **c** Malioboro Mall, Yogyakarta (after www.tunjunganplaza.com and https://surabayatravel.com/grand-city-mall.html)

6 The Footpaths

In urban life, footpaths are critical components of roadway systems. Besides the primary function for pedestrians, footpaths have many other features, such as accommodating street vendors and merchants (Loukaitou-Sideris and Ehrenfeucht 2009), which in some cases might reduce the walkability of pedestrians. Under the Government Regulation of the Republic of Indonesia number 43 dated 1993 (Law Bureau of Republic of Indonesia 2003), a footpath is defined as a facility to support traffic activities and road transportation both on the roadside and adjacent to the road, in the context of safety, security, good order, smooth traffic, and provide convenience for the users. Thus, the keyword of this regulation is convenience, which includes safety and security. Surabaya's footpaths were massively improved in the last ten years. The Surabaya municipality also attempted to accommodate the needs of disabled people, particularly the visually impaired, by installing guiding blocks along the footpaths. However, without careful installation, the placement of guiding blocks is somehow ineffective in many spots. Nine routes and spots of the most improved footpaths in Surabaya were surveyed (Fig. 3).

7 The Participants

The study involved sighted and visually impaired participants. The sighted participants were Petra Christian University (PCU)'s undergraduate students, and the visually impaired

Fig. 3 **a** Snapshots of the footspath at Siola-Tunjungan segments and **b** Darmo segments of Surabaya

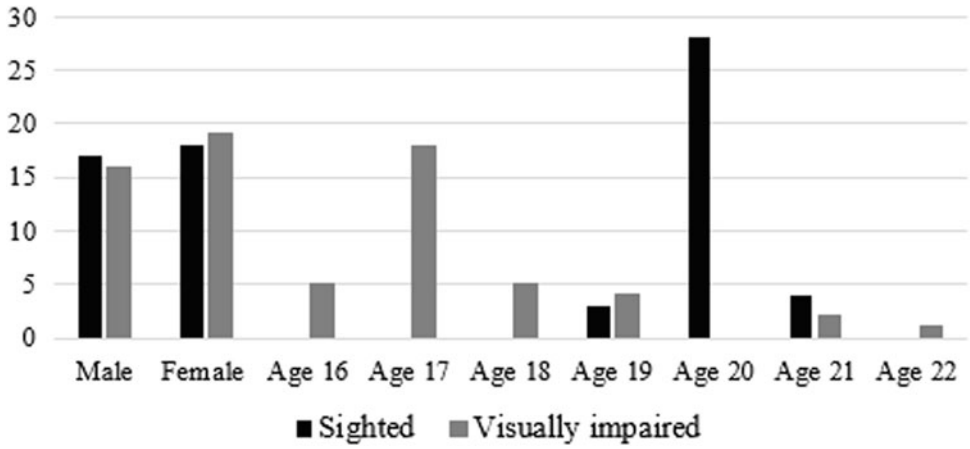

Fig. 4 Demographic background of the participants

were a group of junior and senior high school students of the Foundation of Education for Blind Children, namely YPAB, of Surabaya and Yaketunis Foundation of Yogyakarta. Seventy students in total are involved in this project. The demographic background of the participants is plotted in Fig. 4. The participants have resided in Surabaya and Yogyakarta for a certain period of time, either as locals or as students. The age gap at this point was considered to be within an acceptable range since Ma et al. (2018) showed that studies of soundscape involving broad age range elicited quite identical responses. The project plan to partnering with YPAB was presented to a panel of the independent research ethics committee of the Ministry of Research and Technology and Higher Education of the Republic of Indonesia. It was then granted by the Body of National Unity, Politics, and Community Protection (Bakesbangpol), a body under the Surabaya City Government. The sighted participants were not involved in the footpath survey as the survey at parks, and shopping malls

showed soundscape dimensions of locals in Surabaya and Yogyakarta are identical to studies by Axelsson et al. (2010) and Kang and Zhang (2010). It strengthens the finding of Ma et al. (2018) that studies of soundscape involving various backgrounds also elicited quite identical responses.

8 The Questionnaire

A perceptual measurement of sound quality is a multidimensional problem that includes individual auditory attributes. Therefore, it is reasonable to elicit and use individual attributes emerge from a mixture of interviews and personal experiences. A procedure belongs to a direct elicitation method, namely individual vocabulary techniques introduced by Bech and Zacharov (2007) was referred to construct and validate the attributes used in the questionnaire. It uses the vocabulary developed by the individual subject and a set of principal components representing the common attributes, which is then identified using statistical procedures. Thus, it is reliable to elicit and use individual attributes emerging from a mixture of interviews and personal experiences. Here, the attributes were developed using a focused group discussion (FGD), with two sighted and two visually impaired persons selected from the 35 sighted and 35 visually impaired participants. They were selected based on their frequent experience of visiting parks as well as their ability to communicate and maintain involvement in the discussion. The ability to communicate is essential to creating an agile discussion to produce detail narrations before they were extracted into the attributes for questionnaire items. Attributes emerged from parks, shopping malls and footpaths discussion are listed in Table 1, 2 and 3, respectively. The attributes were validated using principal component analysis (PCA) before it went to the questionnaire, and those, which are below 0.5, were omitted.

The questionnaire was constructed in 3 sections. Each consisted of open-ended, which questions the general impression of the studied objects and closed-ended questions for the soundscape. The closed-ended questions were built on a straightforward bipolar semantic scale of −1 0 1. The −1 scale was used for the attributes that emerged from the FGD, 0 for the neutral response, and 1 for the antonym of the attributes. The use of three-point-scales is still debatable, whether adequate (Jacoby and Matell 1971) or inadequate (Lehmann and Hulbert 1972). Nonetheless, since an experiment of an informal interview using five scales has caused a miscommunication between the visually impaired participants and the interviewers, the use of three-point scales was confirmed. The simplification of the scale, from commonly 5 or 7 points-scale to 3 only, was intended so as the interviewee would shortly grasp the question and be able to answer the item instantly. Furthermore, this method is validated by comparing the result of the soundscape dimension of the regular or sighted participants with the soundscape dimensions from the earlier studies. For the parks and footpaths survey, the antonym of the attributes was indirectly stipulated from the FGD (Tables 1 and 3). Whereas for the shopping malls survey, they were stipulated directly from the FGD as can be seen in Table 2.

Table 1 The attributes used to develop a semantic scale of the closed-ended questionnaire for the park survey

Number	Attributes	
	Sighted	Visually impaired
1	Crowded	Crowded
2	Calm	Calm
3	Nice	Nice
4	Disturbing	Disturbing
5	Comfortable	Comfortable
6	Clamorous	Clamorous
7	Noisy	Noisy
8	Fun	Fun
9	Rough	Rough
10	Unhurried	Unhurried
11	Natural	Natural
12	Dense	Safe
13	Good	Good*
14	Fine	Unclear Direction
15	Full	Full
16	Silence	Far
17	Neat	Slow
18	Relax	Variation*
19	Like	Recognize the location
20	Monotonous	Important sound*
21	–	Scary
22	–	One direction*
23	–	Spacious

Annotation: The principle component analysis shows the score of the asterix (*) was < 0.5
Thus, these attributes were ommited from the constructed questionnaire

By Tables 1 and 2, we see that visually impaired people use more attributes than the sighted to describe their surroundings. It correlates to a study by Gonzales-Mora et al. (1999) who stipulated that blind people are more sensitive to sound than sighted people.

9 The Soundwalk

As the listening method was conducted within a particular area, which is spacious enough, the method was extended into soundwalk. A soundwalk is a method that implies a

Table 2 The attributes used to develop a semantic scale of the close-ended questionnaire for the shopping mall survey

Number	Attributes	
	Sighted	Visually impaired
1	Complete–incomplete	Happy–unhappy
2	Good–bad	Good–bad
3	Crowded–empty	Spacious–narrow
4	Clear signage–unclear	Cool–warm
5	Neat–messy	Noisy–calm
6	Luxurious–slum	Large–small
7	Tight–loose	Luxurious–slum
8	cool–warm	Modern–ancient
9	Comfortable–uncomfortable	Know the location–don't
10	Like–dislike	Slow–loud
11	–	Safe–dangerous
12	–	Clamorous–quiet
13	–	Know the smell–don't*
14	–	Comfortable–uncomfortable
15	–	Like–dislike

Annotation: The principle component analysis shows the score of the asterix (*) was < 0.5
Thus, these attributes were ommited from the constructed questionnaire

Table 3 The attributes used to develop a semantic scale of the closed-ended questionnaire for the footpath survey performed by visually impaired participants only

Number	Attributes	Context
1	Crowded	Soundscape
2	Comfort	Soundscape
3	Noisy	Soundscape
4	Fun	Soundscape
5	Rough	Soundscape
6	Natural	Soundscape
7	Safe	Soundscape
8	Unclear direction	Soundscape
9	Far	Soundscape
10	Slow	Soundscape
11	Know the position	Soundscape
12	Full	Soundscape
13	Scary	Soundscape
14	Spacious	Soundscape
15	Easy	Access
16	Slippery	Access
17	Clear route	Access
18	Near traffic	Access
19	Flat	Access

walk in an area with a focus on listening to the acoustic environment (ISO 2018). The soundwalks were held with the visually impaired participant walked side-by-side the accompanying person. Here, the accompanying persons were the sighted participants. At the parks and shopping malls, the soundwalk was carried out by both sighted and visually impaireds. Whereas on the footpaths only by the visually impaired. The decision not to involve sighted participants was deliberately made as previous studies, and the study at the parks have shown no difference in soundscape

dimensions by the sighted. Thus, for the footpaths, as it was also performed outdoors just like the parks, the data was collected from the visually impaired only. Whereas for shopping malls, as there are limited studies about indoor soundscape to validate the result, the soundwalk in shopping malls was conducted by both the sighted and the visually impaired.

In the places where both participants conducted the soundwalk, the visually impaired was each accompanied by a sighted person. The accompanying persons (interviewers) for the visually impaired participants were the sighted participants in the trial. The natural quietness during the soundwalk was maintained so that the soundscape could be purely perceived. The accompanying persons paid attention only when the participants were about to encounter a dangerous situation, such as towards a significant pavement gap, a massive obstruction, or about to cross the street. The soundwalk was designed to pass the appointed routes and spots, and the interview was conducted after each route. It was designed so as the conversation between interviewer and interviewee does not interfere with the soundscape activity.

10 Findings and Discussion

The data were analysed at a time using PCA with a change of coordinates known as varimax rotation (Field 2000) so that each variable can be associated at most one factor. PCA also used by Axelsson et al. (2010) and Kang and Zhang (2010) to extract their data into soundscape dimensions. The analysis was run for sighted and visually impaired. The soundscape dimensions are selected based on the eigenvalue of the PCA (eigenvalue > 1).

The soundscape dimension terminologies were stipulated based on the grouping of the attributes, which refers to the earlier studies. Axelsson et al. (2010) use pleasantness, eventfulness, and familiarity. Whereas Kang and Zhang (2010) use relaxation, communication, spatiality, and dynamic. Here, 'pleasantness' terminology is used as a similarity to relaxation or comfort and 'eventfulness' as a similarity to communication. Besides two of the most prominent, other soundscape dimensions were also extracted from the data and grouped into dimensions that were named relative to the word that could reflect the terminology that appeared in the group. They are dynamic, danger, direction,

Table 4 The PCA result of the response of sighted participants of the park survey (Kaiser-Meyer-Olkin test = 0.907)

Attributes	Factors		
	25% (1: Pleasantness)	22% (2: Eventfulness)	9% (3: Dynamic)
Crowded	0.184	0.751	−0.057
Calm	0.346	−0.774	0.056
Comfortable	0.695	−0.444	0.039
Disturbing	−0.545	0.515	0.220
Noisy	−0.331	0.780	−0.112
Natural	0.581	−0.400	0.118
Dense	−0.117	0.791	−0.058
Fun	0.804	0.002	0.155
Good	0.817	−0.147	0.062
Rough	−0.562	0.493	−0.020
Unhurried	0.413	−0.580	0.210
Clamorous	−0.467	0.654	−0.133
Fine	0.794	−0.160	0.015
Nice	0.829	−0.160	0.190
Monotonous	−0.264	−0.237	0.622
Silence	0.171	−0.695	0.492
Full	0.037	0.711	−0.388
Neat	0.279	−0.068	0.775
Relax	0.500	−0.380	0.577
Like	0.854	−0.077	0.063

Table 5 The PCA result of the response of visually impaired participants of the park survey (Kaiser-Meyer-Olkin (KMO) test = 0.846)

Attributes	Factors					
	17% (1: Eventfulness)	14% (2: Pleasantness)	8% (3: Danger)	8% (4: Direction)	7% (5: Space)	6% (6: Nature)
Crowded	0.708	0.032	0.107	0.090	0.067	0.220
Calm	−0.626	0.432	0.075	−0.002	0.119	0.130
Nice	−0.036	0.740	−0.097	−0.003	−0.052	0.054
Disturbing	0.346	−0.621	0.229	−0.048	0.085	−0.088
Comfortable	−0.283	0.754	−0.155	−0.033	0.181	0.016
Clamorous	0.753	−0.232	0.062	0.081	0.050	−0.069
Noisy	0.803	−0.194	0.021	−0.012	0.014	−0.152
Fun	−0.107	0.729	−0.153	0.107	0.137	0.045
Rough	0.597	−0.115	0.182	−0.144	−0.154	−0.370
Slow	−0.670	0.142	−0.181	0.103	0.217	0.173
Natural	−0.218	0.053	−0.096	−0.110	0.107	0.616
Safe	−0.151	0.233	−0.711	0.144	0.065	0.117
Unclear direction	0.088	−0.115	0.145	−0.791	0.023	−0.044
Far	−0.076	0.080	0.055	−0.050	0.757	0.253
Slow	−0.137	0.127	−0.092	0.026	0.203	0.578
Recognize the location	0.084	−0.058	0.055	0.810	−0.035	−0.066
Full	0.508	0.177	0.160	−0.083	−0.369	0.331
Scary	0.066	−0.143	0.843	0.016	0.025	0.006
Spacious	0.059	0.360	−0.146	−0.085	0.530	−0.329

space, nature, facility and contour. The naming is a subjective judgement, as was that of Axelsson et al. (2010) and Kang and Zhang (2010).

The extraction of the data of park surveys shows that soundscape dimension of pleasantness was perceived as the most prominent by the sighted participants (Table 4), followed by eventfulness and dynamic dimensions. Whereas visually impaired participants perceived soundscape dimension of eventfulness as the first dimension (Table 5). Again, we see that visually impaired people engaged more to the surrounding than the sighted as they explain the acoustic environment with more dimensions than the sighted. The soundscape dimension of danger and direction emerged uniquely from the visually impaired participants.

Table 6 The PCA result of the response of sighted participants of the shopping mall survey (Kaiser-Meyer-Olkin test = 0.8191)

Attributes	Factors		
	35% (1: Pleasantness)	27% (2: Space)	17% (3: Facility)
Complete–incomplete	0.077	0.096	0.911
Good–bad	0.825	−0.140	0.238
Crowded–empty	−0.139	0.943	0.056
Clear signage–unclear	0.058	−0.456	0.711
Neat–messy	0.502	−0.639	0.290
Luxurious–slum	−0.926	0.188	0.217
Tight–loose	−0.366	0.832	−0.107
Cool–warm	−0.614	0.348	−0.018
Comfortable–uncomfortable	0.691	−0.422	0.251
Like–dislike	0.827	−0.260	0.281

Table 7 The PCA result of the response of visually impaired participants of the shopping mall survey (Kaiser-Meyer-Olkin test = 0.722)

Attributes	Factors				
	31% (1: Pleasantness)	15% (2: Space)	13% (3: Eventfulness)	10% (4: Danger)	8% (5: Direction)
Happy–unhappy	0.903	0.124	0.118	−0.004	0.061
Good–bad	0.892	−0.033	0.098	0.074	0.048
Spacious–narrow	0.066	0.924	0.014	−0.035	0.012
Cool–warm	0.209	0.425	−0.240	0.410	−0.388
Noisy–calm	0.192	0.210	0.756	0.099	0.235
Large–small	0.327	0.855	0.138	−0.021	0.037
Luxurious–slum	0.821	0.207	0.020	−0.147	−0.046
Modern–ancient	0.800	0.089	0.079	0.270	−0.173
Know the location–don't	0.029	0.048	−0.040	0.163	0.864
Slow–loud	0.093	0.032	−0.745	0.160	0.181
Safe–dangerous	−0.139	−0.017	0.132	0.825	0.223
Clamorous–quiet	0.188	0.017	0.764	0.220	−0.078
Comfortable–uncomfortable	0.744	0.357	−0.031	−0.470	0.019
Like–dislike	0.773	0.281	0.006	−0.394	0.041

In the shopping malls, both participants perceived soundscape dimension of pleasantness and space as the first and second dimensions, respectively (Tables 6 and 7). The sighted added soundscape dimension of the facility to the acoustic environment. Whereas, the visually impaired added with eventfulness, danger and direction dimensions. It is

Table 8 The PCA result of the response of visually impaired participants of the footpath survey (Kaiser-Meyer-Olkin test = 0.739)

Attributes	Factors			
	25% (1: Pleasantness)	11% (2: Space)	10% (3: Eventfulness)	9% (4: Contour)
Crowded–uncrowded	0.392	0.127	0.667	−0.050
Comfortable–uncomfortable	0.642	0.070	−0.205	0.401
Noisy–quiet	−0.100	−0.200	0.832	−0.020
Fun–boring	0.621	0.130	−0.070	0.405
Rough–soft	−0.217	−0.587	0.303	−0.126
Natural–artificial	0.317	0.101	0.111	0.426
Safe–dangerous	0.676	−0.020	−0.030	0.080
Unclear direction–clear direction	−0.777	0.080	−0.107	−0.080
Far–near	−0.100	0.722	0.090	−0.249
Slow–fast	−0.010	0.633	−0.060	0.123
Know–don't know the position	0.753	−0.080	0.112	−0.040
Full–empty	−0.189	−0.271	0.713	−0.008
Scary–soothing	−0.714	−0.060	0.249	0.137
Spacious–cramped	0.145	−0.222	−0.138	0.461
Easy–uneasy access	0.733	−0.110	−0.122	0.143
Slippery–coarse	0.462	0.218	0.070	0.327
Clear–unclear route	0.765	0.110	0.060	−0.020
Near–far traffic	0.005	−0.706	0.174	−0.050
Flat–up and down	−0.180	0.131	−0.010	0.847

interesting to learn that within an indoor environment of a shopping mall, the dimension of pleasantness of the visually impaired is not affected by the indoor thermal condition whereas thermal factor is regarded as an important element affecting the dimension of pleasantness perceived by sighted people. In the shopping malls, we also see that the visually impaired captured the surrounding in more detail.

On the footpaths, where the data was collected by visually impaired participants only, we see the soundscape dimension of pleasantness as the most prominent (Table 8). The first dimension of pleasantness is also associated with the dimensions of danger and direction at the same time. Here, the visually impaired participants also perceived a unique soundscape dimension of contour. At places with specific corridors or routes, such as footpaths and shopping malls, the dimension of pleasantness is the most prominent for both participants. However, it was not the case at parks, where the soundscape dimension of the sighted differs from that of the visually impaired. At the parks, where visitors usually do not have a particular route to walk through, soundscape dimension of eventfulness is the most prominent for the visually impaired. At parks or places with free routes to be accessed, an acoustic environment that creates eventfulness information is the key sonic element to guide the visually impaired. The shaded numbers in Tables 4 to 8 represent particular attributes that correlate to the above-mentioned soundscape dimensions.

11 Conclusion

The study has pointed out that soundscape dimensions of pleasantness and eventfulness are the two-most important in parks, shopping malls and on footpaths. These two soundscape dimensions were added by other dimensions, which some of them uniquely elicited by the visually impaired. Here, we learn that visually impaired people describe the acoustic environment in more detail than do sighted people. The visually impaired also use sound to detect danger, to identify the direction or location and to appraise a space. The finding shows that an acoustic environment is also a key element to create urban public places to be more user friendly. Municipalities in emerging countries may adopt people's sonic perception to improve current policies to accommodate dwellers' and visitors' needs inclusively.

Further study to identify specific sound sources and sound characters that may help the visually impaired to live their life independently is recommended. A recorded and simulated soundscape is considered strategic so as the visually impaired participants may add or eliminate sound sources and types and adjust the appropriate loudness level of each sound to provide an excellent acoustic environment to identify danger, direction and space. The sonic dimensions appreciated by the visually impaired and the recommended study that deepens the current findings might also be valuable to shape the type of sound needed in each unique public place to develop the city's sonic identity. Thus, the sonic character, will not serve for identification only, but also to provide guidance, safety, and comfort for city dwellers and visitors inclusively. Nonetheless, the conclusions drawn in this study may not be instantly transferrable to other regions with different parks, shopping malls and footpaths characteristic.

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