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Indoor soundscape perception in residential spaces: A cross-cultural analysis in Ankara, Turkey

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Abstract

Studies in the literature suggest that factors influencing soundscape perception are based heavily on sound environments and auditory perception. Nevertheless, in studying the soundscape perception of people living in certain acoustic environments, cultural, social and habitual criteria should be taken into consideration. Residential environments are where people spend most of their time. Therefore, understanding the soundscape perception in the residential context is significant for indoor soundscape studies. This research investigates the residential soundscape perception differences of two different culture groups living in Ankara, Turkey. A total of 405 Arab and Turkish residents are included in the study. The questionnaire findings are statistically analysed using one-way analysis of variance and t-test. The results suggest that the sound environment in a house setting is equally important for both culture groups, while the Arab residents showed a higher satisfaction level from their present sound environment in their residences. Furthermore, statistically significant differences have been found based on cultural variances of the two groups regarding the overall soundscape perception, sound source loudness, frequency of occurrence, and sound favourability evaluations.

Keywords

Indoor soundscaping, soundscape questionnaire, sound perception, residential soundscape, cultural difference

Introduction

During the last one-hundred years, changes in the urbanisation and social context, mainly due to the Industrial Revolution, imposed many differentiations on soundscapes and acoustic environments in most of the major cities around the world.[1] Therefore, the acoustic or sonic environment of an urban space becomes the primary factor among others that influence the soundscape perception of an individual.[2] People spend approximately 90% of their time indoors and 65% of that time is spent in house settings.[3] There are many indoor environmental factors that influence people's experiences in residential spaces, including thermal comfort, visual comfort, air quality and acoustic comfort,

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which have serious effects on residents' physiological and psychological health.[4] Particularly for soundscape studies, acoustic factors are among the most important environmental comfort parameters that are taken into consideration while designing such spaces to assess their environmental qualities. Therefore, evaluating the overall acoustic perception in a space for its users within a specific context should be studied under the research area of 'soundscape perception'.[5]

The term soundscape is defined as an 'acoustic environment as perceived, experienced and/or understood by a person or people, in a given context'.[6] From the definition, it is understood that the manner in which a person or group of people understand the acoustic environment within a certain context (residential, working, teaching, social, etc.) plays a major role in determining the soundscape. Moreover, as soundscape perception depends heavily on experience, it also involves cultural, social and psychological factors. This understanding is supported in many other studies in which a soundscape is tied mainly to the changing characteristics of the listener and the context. In the literature, there are several cross-cultural soundscape studies which specifically address the differentiated perception of acoustic environments according to contextual and cultural variations.[7–9] Many related studies, given definitions and presented methodological approaches, make soundscape to appear as a complex research field.[10–12] However, the soundscape principle is built on research areas such as acoustic environments, auditory perceptions and acoustic comfort, as well as the manner in which people interact with a particular environment within a given context and how they perceive it according to their individual backgrounds.[13] Therefore, all these areas are closely linked with soundscape and should be considered within the scope of soundscape studies that include cultural, social, individual and contextual variations.

The effects of different sound sources on overall annoyance have been reported previously in other studies.[14,15] In addition to perceptual studies on sound source annoyance, building materials and their acoustic performance classes for residential buildings have been proposed.[16–18] However, the most common approach is to use surveys and questionnaires to assess the overall noise annoyance and acoustic comfort of users in residential contexts.[19–24] This approach is also used in indoor soundscaping studies that concentrate on the soundscape perception of enclosed sound environments.[25–27] Furthermore, physiological, psychological and perceptual effects of indoor and outdoor sound sources on residential environments,[28–30] sound source levels and visibility[31–33] and sound source types as artificial versus natural have been studied in residential environments.

Qualitative methods, such as structured and narrative interviews[34] and discussion groups, and quantitative methods, such as listening tests, auditory experiments[35,36], surveys and questionnaires, are mostly used to collect data on the perception of soundscapes. These are the most reliable and accepted methods to understand the subjective reactions of people to the nature of an acoustic environment. Therefore, when evaluating soundscape perception, it is important to consider the reactions from people towards different sound sources and the overall sound environment, which relates well with the soundscape evaluation.[37] Furthermore, personal factors such as personal goals, personality traits and activity, psychological states and external factors also play important roles in the evaluation of soundscape perception.[2] In addition, environment-oriented factors such as odour, temperature, humidity and lighting, factors related to sound and its characteristics such as loudness; spectral, temporal and informative content; source location and movement and landscape or architectural factors should be included.[2]

Evaluating the soundscape perception in any space has two main elements, namely the environment that contains the collective acoustic effects and the people who perceive the acoustic environment within that given context. Therefore, in this study, cultural background and environmental factors have been the key elements in the design process. Initially, it has been observed that there is no specific study that concentrates on the soundscape perception of different culture groups residing in Turkey. Furthermore, a gap in the literature was also identified such that there has been no study

on the soundscape perception of Turkish residents or a comparative study with other residents from different backgrounds living in Turkey. Therefore, in this study, the acoustic environment has been selected to be the residential areas in the capital city of Turkey, Ankara, with Turkish and Arab people residing in different parts of the city. Different cultural, social and habitual backgrounds are considered in order to understand the affecting factors of soundscape perception. Moreover, as the Arab people had lived mostly in different acoustic environments in their home countries, this research compares the manner in which they perceive the soundscape of Ankara to the manner in which Turkish people perceive it.

Methodology

The aim of this study is to concentrate on the soundscape perception in enclosed residential environments by analysing the auditory perception and acoustic comfort of Arab people living in Ankara, Turkey, in comparison to the Turkish residents of the city and by considering the cultural, social and habitual similarities and differences. Thus, a questionnaire method was adopted, including questions on three main factors for in-depth analysis.

1. Demographic and usage factors, which are evaluated through questions on age, gender, occupation, education level and nationality. In addition, total living time in the residence and usage time patterns are also considered.
2. Residential environment factors, which are evaluated by questions on residence characteristics such as location, type and floor level.
3. Acoustic environment and soundscape factors, which are evaluated through questions on importance, satisfaction and sound source perception. Questions focusing on acoustic environment and soundscape factors include six evaluation items: (1) importance of the sound environment in the residence, (2) satisfaction from the sound environment in the residence, (3) overall soundscape evaluation, (4) sound source loudness, (5) sound source frequency of occurrence and (6) sound source favourability.

The most accepted approach that is seen as the starting point of soundscape research field is by Murray Schafer. His sound source classification[38] and Brown's et al.[13] taxonomy act as the backbone of this study. Sound sources are identified by the researcher through previous site visits, sound observations and investigations into the considered case sites and are compiled into a comprehensive list based on these classifications and observations for the questionnaire design of this study.

The questionnaire included a total of 17 questions. The questionnaire is designed both in Turkish and Arabic and is answered directly by the residents. The results of the questions on the acoustic environment and soundscape factors are analysed in accordance with the information gathered from the cultural background of the participants, their demographical differences and usage patterns. Questionnaire participants have also selected their residence type among the categories indicated in the questionnaire as being detached house, attached house, terraced house or apartment in addition to the location of their residence in the city and floor level if the residence is located in an apartment complex. The results have been analysed statistically and reported in detail.

Results and discussion

Demographics and usage patterns

The targeted sample size was set as 405 questionnaires, which achieves a confidence level of 95% and increases the reliability of the data when an Arab population of 500,000 and a Turkish

Table 1. Mean values of participants' usage time periods in their residences (shortest time rated as 1, longest time rated as 4).

		Morning (06:00–12:00)	Afternoon (12:00–18:00)	Evening (18:00–24:00)	Midnight (24:00–06:00)
Arab residents (n = 201)	Mean	1.83	2.00	2.57	3.60
	SD	1.035	0.797	0.822	0.850
Turkish residents (n = 204)	Mean	1.69	1.70	2.79	3.82
	SD	0.824	0.669	0.651	0.569

SD: standard deviation.

population of 4,500,000 are considered. Moreover, the total target number of questionnaires was divided evenly, to the closest extent, between the Arab (n = 201) and Turkish (n = 204) participants of the questionnaire, establishing the experimental and control groups, respectively.

A total of 238 men and 167 women participated in the questionnaire. For the study groups, the Arab group had a distribution of 66% and 34% for men and women, respectively, while the Turkish group has a distribution of 52% and 48% for men and women. Around 82.1% of the Arab residents in Ankara are between 26 and 45 years of age. The Turkish participants had a similar distribution among the different age categories. Furthermore, the majority of the Arab residents (n = 123) participating in the study were students, while the majority of Turkish residents (n = 110) participating in the study were working people, which also confirms the demographic nature of the two culture groups living in the city. In addition, the majority of the participants are holding or are pursuing Master's or Bachelor's degrees for both groups (n = 291).

While the sample size of Turkish residents conforms to the control group count, the experimental group counts consisting Arab residents are distributed among eight countries, namely Libya, Syria, Iraq, Egypt, Jordan, Palestine, Saudi Arabia (KSA) and Algeria. The majority of the Arab participants, at 80%, were from Libya and Iraq.

The usage patterns of the participants of both groups were asked to indicate the time periods that they spend the least and the most in their residences during a day. As presented in Table 1, the means indicate the *morning* period to be the least rated period during which people of both groups spend their time in the residence, while the midnight period shows the highest rated mean scores with the lowest standard deviation indicating that people of both groups spend most of their time around midnight in their residences, particularly to sleep.

Residential environment

Initially, the participants were asked to indicate their area of residence within Ankara, out of the 12 municipalities that form the greater city area. The results show that 66% of Arab residents and 38% of Turkish residents live in the Çankaya district, which is one of the most central and busiest districts in the city. In addition, living periods in the considered housing units are also included in the questionnaire to avoid any possible bias. The majority of the Arab group, 77%, have lived in their current homes for a period ranging from 1 to 5 years. The Turkish group shows similar percentage ranges for different time periods: 35% between 1 to 5 years, 30% 5 to 10 years and 23% more than 10 years.

The characteristics of the apartment and its location within a housing complex are also considered to analyse possible variations. For both groups, apartment housing is the most common dwelling type with 91% and 95% for the Arab and Turkish groups, respectively. The participants have

Table 2. Means comparison between Turkish and Arabic residents in Ankara on the importance of and satisfaction from the sound environment of their residences.

	n	Importance of sound environment		Satisfaction from sound environment	
		Mean score[a]	SD	Mean score[a]	SD
Turkish residents	204	3.35	0.646	2.75	0.758
Arab residents	201	3.30	0.721	3.04	0.658

SD: standard deviation.
[a]Score 4.0 represents higher importance and satisfaction levels; hence, a higher mean reflects higher importance or satisfaction scores.

Table 3. One-way ANOVA testing for the importance of sound environment to the study groups.

	Sum of squares	df	Mean square	F	Significance
Between groups	0.300	1	0.300	0.641	0.424*
Within groups	188.678	403	0.468		
Total	188.978	404			

*$p < 0.05$, **$p < 0.01$.

also indicated the location of their apartment within their building, and it was found that the majority in both groups reside on intermediate floors. However, it is also noted that 38% of the Arab group have an apartment located on the basement floor. No significant differences are noted for the factors that are considered under residential environment characteristics that are included in the questionnaire.

Acoustic environment: importance and satisfaction

The mean scores of 'importance of the acoustic environment in the residence' and 'satisfaction from the sound environment in their residence' are compared for both participant groups. Table 2 shows the mean scores of the Turkish and Arab residents. The results of the analysis show that there is no significant difference in the perception of the importance of the acoustic environment between the two groups. However, both scores are higher than the neutral mean score of 2.0, showing that the residential sound environment is relatively important for both groups. On the contrary, the Turkish residents' mean score (2.75) shows a moderate satisfaction from the sound environment of their residences in Ankara, being higher than the mid-range score of 2.0, while the Arabic residents' mean score (3.04) shows a higher satisfaction level in comparison to the Turkish residents.

To confirm the correlation between the importance of the sound environment of the residential context of Ankara and the cultural background of the participants, a one-way analysis of variance (ANOVA) test was also conducted and yielded a level of significance of 0.424, indicating no difference between either study group, as presented in Table 3.

In addition, an identical statistical analysis was also performed to confirm the correlation between the satisfaction from the sound environment of the residential context of Ankara and the cultural background of the participants, which yielded a high level of significance ($p < 0.05$), indicating a strong correlation between the two parameters, as shown in Table 4. In another similar study on soundscape perception between British and Taiwanese living environments, the results

Table 4. One-way ANOVA testing for the satisfaction of sound environments to the study groups.

	Sum of squares	df	Mean square	F	Significance
Between groups	9.092	1	9.092	18.020	0.000**
Within groups	203.342	403	0.505		
Total	212.435	404			

*$p < 0.05$, **$p < 0.01$.

Table 5. Semantic differential analysis mean scores for both groups.

Adjective pairs	Turkish residents (n = 204)		Arab residents (n = 201)	
	Mean score[a]	SD	Mean score[a]	SD
Bad–good	2.81	0.691	3.11	0.623
Noisy–quiet	2.70	0.725	3.09	0.602
Stressing–peaceful	2.84	0.739	3.08	0.590
Negative–positive	2.85	0.700	3.06	0.557
Uncomfortable–comfortable	2.89	0.764	3.05	0.590
Unfavourable–favourable	2.87	0.707	3.04	0.577
Unpleasant–pleasant	2.81	0.741	3.00	0.616
Agitating–calm	2.74	0.753	2.93	0.561

SD: standard deviation.
[a]A score of 4.0 represents the most positively connotlyed adjective, while score 1 represents the most negatively connotlyed adjective.

showed a higher satisfaction level for soundscape perception in Taiwanese living environments when compared to British environments.[8]

These results indicate that both participant groups rate the sound environments in their residences to be moderately to highly important, yet the satisfaction rating shows a significant difference for the two participant groups. Arab residents are significantly more satisfied with the sound environment in their residences than the Turkish residents. This yields an interesting result, which can be related to the social and cultural background of the Arab residents and tested in detail through semantic differential analysis for the soundscape evaluation and sound source perception.

Soundscape evaluation: semantic differential analysis

Semantic differential analysis with a 4-point scale was used for the overall soundscape evaluation of the residences. Eight adjective pairs were included for the evaluation. Table 5 compares the mean scores of both groups for each adjective pair. The analysis results show a higher mean for the adjective assignment for the Arab residents than for the Turkish residents, which reflects a more positive evaluation for all eight categories (Figure 1).

Furthermore, the mean scores indicate, the highest positively connotated mean score for the Turkish residents is the ‘comfort’ rating, yet for Arab residents it is the ‘goodness’ rating of the soundscape. On the contrary, when the negatively connotated mean score comparison is analysed among all negatively connotated adjactives, the most negatively connotated adjective is ‘noisiness’ with the lowest score 2.7 for the Turkish participants and ‘agitating’ with the lowest score 2,93 for the Arab participants (Figure 1).

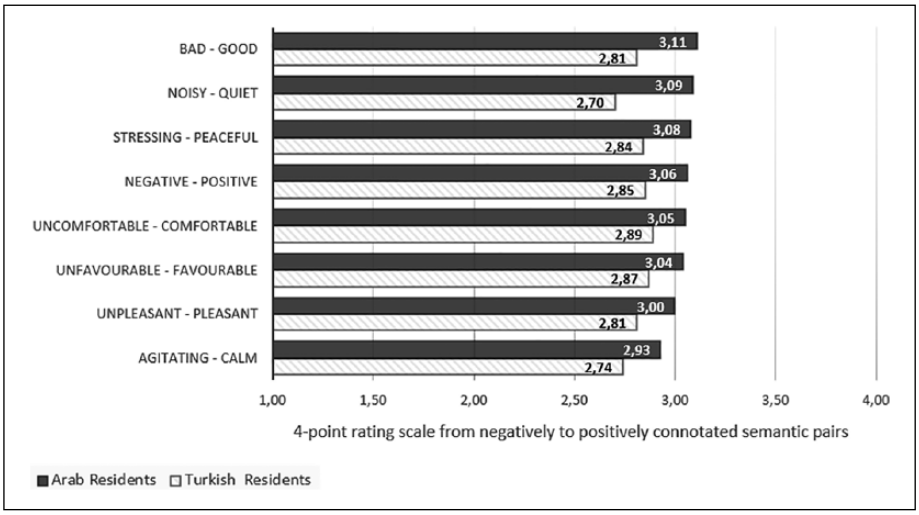

Figure 1. Comparison of semantic differential analysis mean scores for 8 adjactive pairs evaluated in the questionnaire.

One-way ANOVA statistical analysis confirmed a strong correlation between the overall soundscape evaluation of the sound environment in the residential context of Ankara and the cultural background of the city residents, as shown in Table 6. The results are also confirmed through an independent samples t-test, which showed a significance of less than 0.05 for the Levene's test for equality of variances, with the exception of the 'bad-good' adjective pair, where it was calculated as 0.171.

The statistical results confirm that the answers from Turkish and Arab residents are significantly different for the soundscape evaluation that was performed by the semantic differential analysis for the residential sound environment. This differentiated evaluation of the soundscapes in the residential context may be highly related to the varied cultural, social and habitual backgrounds of the residents.

Sound source perception

Sound source perception analysis is performed by considering three factors, namely sound source perceived loudness, sound source frequency of occurrence and sound source favourability. A total of 22 sound sources were considered for evaluation. These sound sources were indicated by previous on-site listening and observations. The statistical significance of the three sound source perception factors were tested using one-way ANOVA in order to present the possible difference with regard to cultural variations. Compared mean scores of each sound source evaluation for both culture groups and their significance levels are reported in Table 7.

The results of the sound source loudness perception indicate that cultural differences influence the loudness perception of several sound sources, as highlighted in Table 7; however, there is no significant correlation between other sound sources. Arab residents perceive the sounds inside their residences, such as domestic equipment and movement in the house, to be louder than the Turkish residents, while the Turkish residents perceive all natural sound sources, in addition to the sounds of airplanes, horns from vehicles, school bells, market shutters, nearby construction sounds and neighbours talking/shouting, to be louder than do the Arab residents. This finding could be attributable to the cultural background of Arab participants, where louder natural sounds

Table 6. One-way ANOVA testing for overall soundscape evaluation of the study groups.

Adjective pairs	Sum of squares	df	Mean square	F	Significance
Bad–good					
Between groups	8.854	1	8.854	20.447	0.000**
Within groups	174.514	403	0.433		
Total	183.368	404			
Noisy–quiet					
Between groups	15.287	1	15.287	34.388	0.000**
Within groups	179.148	403	0.445		
Total	194.435	404			
Stressing–peaceful					
Between groups	5.902	1	5.902	13.174	0.000**
Within groups	180.543	403	0.448		
Total	186.444	404			
Negative–positive					
Between groups	4.539	1	4.539	11.309	0.001**
Within groups	161.747	403	0.401		
Total	166.286	404			
Uncomfortable–comfortable					
Between groups	2.673	1	2.673	5.733	0.017*
Within groups	187.909	403	0.466		
Total	190.583	404			
Unfavourable–favourable					
Between groups	3.177	1	3.177	7.619	0.006**
Within groups	168.023	403	0.417		
Total	171.200	404			
Unpleasant–pleasant					
Between groups	3.700	1	3.700	7.951	0.005**
Within groups	187.544	403	0.465		
Total	191.244	404			
Agitating–calm					
Between groups	3.661	1	3.661	8.276	0.004**
Within groups	178.255	403	0.442		
Total	181.916	404			

*$p < 0.05$, **$p < 0.01$.

and traffic sounds generally dominate the indoor residential environment as a result of open-window usage for ventilation purposes. Therefore, loudness perception threshold shifts may possibly interfere their evaluation.

The results for sound source frequency of occurrence show that Arab residents perceive equipment sounds in their residences as occurring more frequently than do the Turkish residents, while the Turkish residents perceive all natural sound sources, in addition to planes, trains/subway trains, nearby construction and neighbours talking/shouting, more frequently than do the Arab residents.

In a similar study on urban soundscapes, which examined the soundscape perception of the inhabitants of French cities towards several sound sources and the number of occurrences of every sound, the results indicated that natural sounds and bird sounds were the most positively rated sound sources, while cars, traffic and angry people were the most negatively rated.[39] Furthermore, the effect of cross-cultural differences on the sound source perception is indicated in British and

Table 7. One-way ANOVA statistical test results on significant means difference for sound source loudness, sound source frequency of occurrence and sound source favourability evaluation for both culture groups.

	Sound source loudness[a]			Sound source frequency of occurrence[b]			Sound source favourability[c]		
	Arab residents mean scores	Turkish residents mean scores	Significance	Arab residents mean scores	Turkish residents mean scores	Significance	Arab residents mean scores	Turkish residents mean scores	Significance
Planes, jets and helicopters	0.92	1.64	0.000**	0.88	1.45	0.000**	3.15	2.79	0.000**
Trains or subway trains	0.25	0.36	0.183	0.24	0.41	0.036*	3.39	2.59	0.000**
Motorcycles, cars, buses and trucks	1.92	1.98	0.599	1.89	1.87	0.914	3.29	2.94	0.000**
Horns from vehicle	1.72	2.10	0.001**	1.79	1.97	0.123	3.28	3.03	0.002**
Police/ambulance sirens	1.82	2.03	0.082	1.64	1.88	0.055	3.20	2.87	0.000**
Nearby schools	1.15	1.53	0.005**	1.25	1.45	0.134	2.86	2.66	0.02*
Religious sounds	2.19	2.27	0.420	2.45	2.24	0.080	1.37	2.37	0.000**
Shutters of shops/markets	0.52	0.74	0.028*	0.56	0.65	0.371	3.24	2.66	0.000**
Nearby construction	0.78	1.24	0.000**	0.83	1.15	0.004**	3.22	2.92	0.000**
People on the street	1.02	1.20	0.085	1.33	1.25	0.456	2.79	2.65	0.074
Domestic equipment in your house	1.89	1.58	0.002**	1.83	1.56	0.015*	2.96	2.71	0.001**
Talking/shouting in your house	1.93	1.75	0.098	1.72	1.77	0.646	2.91	2.78	0.111
Movement in your house	1.76	1.55	0.047*	1.69	1.63	0.589	3.09	2.81	0.000**
Neighbours talking/shouting	1.37	1.81	0.000**	1.55	1.82	0.017	3.25	3.10	0.04*
Neighbours' domestic equipment	1.20	1.41	0.071	1.39	1.48	0.442	3.27	3.00	0.000**
Neighbours' movement	1.44	1.50	0.546	1.49	1.58	0.453	3.30	2.96	0.000**
Drainage systems/water pipes	1.44	1.35	0.423	1.61	1.38	0.069	3.39	2.93	0.000**
Rain	0.96	1.59	0.000**	0.99	1.47	0.000**	1.83	2.44	0.000**
Wind	0.73	1.53	0.000**	0.80	1.45	0.000**	2.79	2.54	0.003**
Domesticated animals	0.53	1.13	0.000**	0.70	1.08	0.001**	3.25	2.53	0.000**
Street animals (dogs and cats)	0.84	1.33	0.000**	0.95	1.40	0.000**	3.30	2.62	0.000**
Urban birds	0.86	1.44	0.000**	1.13	1.41	0.020*	1.99	2.36	0.000**

[a]A score of 4.0 represents a louder rating for sound source loudness perception.
[b]A score of 4.0 represents a higher rating for sound source frequency of occurrence.
[c]A score of 4.0 represents a lower rating for sound source favourability.
*$p < 0.05$, **$p < 0.01$.

Taiwanese residential environments with the results, which show that in both living environments, inhabitants preferred similar sound types, where quiet sound environments are linked with natural sounds and music is linked with artificial sounds, in both case sit.[8]

In this case study, the majority of the sound source favourability evaluations are statistically differentiated between the two cultural groups. Religious sounds, such as the Azan, and natural sounds, such as rain and urban birds, are ranked as significantly more favourable by the Arab residents. In addition, mechanical sounds, motorised transportation sounds and neighbour sounds are rated as being less favourable by the Arab residents. These results could be due to Turkish residents being accustomed to the sound environment of the city and apartment residential environments, whereas Arab residents who are new to the environment and apartment housing favour such sounds less.

Discussion and conclusion

Questionnaires to 405 Turkish and Arab residents in Ankara, Turkey, were administered to reveal cross-cultural differences that affect soundscape perception. Based on the results of the study, it was found that the cultural differences do not play an important role for the importance given to the residential acoustic environment. In a similar study conducted on three different nationalities, significant differences were not found either in the perceived dominance of sound sources.[7] On the contrary, satisfaction levels from the residential acoustic environment were found to be significantly different when the two participant groups were considered, indicating the crucial role of cultural differences for these specific evaluation criteria. Yu and Kang[8] also found that perception of the living environment can be affected by different cultural and social factors. Therefore, it was concluded that cultural and social factors should be considered as part of soundscape evaluation studies.

Moreover, the overall soundscape perception was tested by semantic differential analysis with the results showing that the two sample groups with different cultural backgrounds perceived their residential sound environment in Ankara with statistically significant differences. Furthermore, it has been concluded that perception of sound source loudness, sound source frequency of occurrence and sound source favourability are significantly different for certain sound sources. Similarly, in a study conducted in the United Kingdom and China, it was found that people could still find the sound environment to be acoustically comfortable despite it being noisy/loud, provided that the soundscape is not dominated by high-level unpleasant sounds such as traffic.[9]

In addition to sonic factors and sound source types, factors such as function, space and time were also studied in the literature as part of the cross-cultural studies.[9] Therefore, this case study also included time-spending traits and housing types of both resident groups in the city in terms of location and floor levels. However, it was found that such factors had minimal impact on the soundscape perception traits of the two tested culture groups.

The findings of this study highlight that soundscape perception depends not only on the objective acoustical characteristics of an environment but also on auditory perception, which is influenced by physiological, psychological and cultural background. The findings of this study show that people who are exposed to identical acoustic environments may develop different soundscape perception tendencies based on their cultural and individual differences. Therefore, it is important to include cultural differences as well as social and individual differences in policy development related to noise and soundscape.

The two important limitations of the study were the lack of the environmental noise levels in the considered residential areas and the lack of information on indoor finishing and construction materials of the case spaces due to the limited number of researchers and limited amount of equipment and time. It is important to raise awareness by this and similar multi-cultural and cross-cultural studies,

especially in culturally diverse cities to lead more research on these topics that could play an important role in policy development with the aim of increasing the quality of life and pleasentness in city life. Furthermore, based on the results of this research, future related studies may consider spaces other than the residential context by integrating other cultural groups in order to investigate further cultural differences as a factor that affects soundscape perception. Finally, similar studies may be performed in other culturally diverse cities around the world in order to compare the results with this study and understand the extent of cultural influences on soundscape perceptions.

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