A COMPARATIVE STUDY ON RESIDENTIAL SOUNDSCAPE PERCEPTION OF ARABIC AND TURKISH PEOPLE LIVING IN ANKARA, TURKEY

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THESIS APPROVALS

Title of the Thesis: **A Comparative Study on Residential Soundscape Perception of Arabic and Turkish People Living in Ankara, Turkey**

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ABSTRACT

A COMPARATIVE STUDY ON RESIDENTIAL SOUNDSCAPE PERCEPTION OF ARABIC AND TURKISH PEOPLE LIVING IN ANKARA, TURKEY

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In studying the soundscape perception of the people of a certain acoustic environment, several concepts should be taken into consideration. Studies from the literature suggest that the main factors that influence the soundscape perception are the sound environment and the auditory perception. As a person spends most of the time in their houses, understanding the soundscape perception in the residential context is significant. This research investigates the soundscape perception differences of two cultural groups of the same acoustic environment. Therefore, the Arab and Turkish residents of Ankara participated with 405 questionnaires in order to assess their soundscape perception of the sound environment of the city within their house environment. The findings of the study suggest that the sound environment is equally important to both cultural groups, while the Arab residents showed a higher satisfaction level from the sound environment in their houses. Furthermore, the cultural factor demonstrated significant differences in the soundscape perception of the Arab and Turkish groups based on an overall soundscape perception evaluation, sound source loudness, sound frequency of occurrence and sound favourability using statistical analysis tests such as, one-way ANOVA and t-test.

Keywords: Soundscape questionnaire, sound perception, residential soundscape, cultural difference, Ankara.

ÖZET

ANKARA'DA YAŞAYAN ARAP VE TÜRK KONUT SAKİNLERİNİN İŞİTSEL PEYZAJ ALGILARI ÜZERİNE KARŞILAŞTIRMALI BİR ÇALIŞMA

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Ağustos 2017, 113 Sayfa

Belirli bir akustik çevrede yaşayan insanların işitsel peyzaj algılarının incelenmesinde birçok kavram göz önüne alınmalıdır. Literatürde bulunan çalışmalar, işitsel peyzaj algısını etkileyen faktörlerin başında ses ortamının ve ses algısının olduğunu göstermektedir. Bir kişinin çoğu zamanını ev ortamında geçirmesi nedeni ile konut bağlamında işitsel peyzaj algısını anlamak çok önemlidir. Bu araştırma, aynı şehirde ve benzer konut ortamlarında yaşayan iki farklı kültürel grubun işitsel peyzaj algı farklarını incelemektedir. Bu çalışma kapsamında, Ankara'da yaşayan Arap ve Türk konut sakinlerinden toplam 405 anket toplanmış, incelenmiş ve sonuçlar detaylı olarak analiz edilmiştir. Çalışmanın bulguları, Arap konut sakinlerinin evlerinde bulunan ses ortamından daha yüksek bir memnuniyet düzeyi belirttiklerini göstermiştir. Bunun dışında her iki kültürel grubun konutlarında bulunan işitsel peyzaja eşit derecede önem verdikleri tespit edilmiştir. Ayrıca, kültürel farklılık, tek yönlü ANOVA ve t-testi kullanılarak irdelenmiş, genel işitsel peyzaj algı değerlendirmesi anket sonuçlarına göre, ortamda bulunan farklı ses kaynaklarının yüksekliği, duyulma sıklığı ve seslerin tercih edilmesi faktörlerinin her birinde anlamlı farklılıklar tespit edilmiştir.

Anahtar Kelimeler: İşitsel peyzaj anketi, ses algısı, konut işitsel peyzajı, kültürel farklılık, Ankara.

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1. INTRODUCTION

1.1. General Overview

As people spend approximately 90% of their time in indoor spaces, of which 65% is spent in the house, the parameters determining the quality of the house indoor environment become significant for further study and enhancement (NSC, 2009). Therefore, there are many elements that influence the house indoor environment, including thermal comfort, visual comfort, air quality and acoustic comfort, which have serious effects on the residents' health physiologically and psychologically (Frontczak, Andersen, & Wargocki, 2012). Moreover, the acoustic factor is one of the important environmental parameters that is taken into consideration when designing a new development or assessing the environmental qualities for a specific space. Nonetheless, evaluating the collective acoustics in a space for its users is accurately classified under the term of "Soundscape Perception" (Axelsson, Nilsson, & Berglund, 2010).

Evaluating the soundscape perception in any space has two main elements, which are the environment that contains the collective acoustic effects and the people that perceive the acoustic environment according. In this research, the acoustic environment is chosen to be the capital of Turkey, Ankara, and the people are chosen to be the Arab people, in comparison with the Turkish people, residing in different parts of the city and come from different cultural and social backgrounds. Moreover, as the targeted people lived mostly in different acoustic environments in their home countries, this research compares the way they perceive the soundscape of Ankara and compare it to the soundscape perception of the Turkish residents of the city. The methodology of this thesis has required an in-depth and detailed statistical analysis and valuable help has been taken from professional statistician for the analysis of the findings.

1.2. Aim and Scope of the Thesis

The main aim of the study is to study the soundscape at the houses, by analyzing the auditory perception and acoustic comfort of Arab people living in Ankara, Turkey; considering the cultural and social similarities and differences with the Turkish residents of the city. Therefore, the scope of this research can be identified as the following:

1. Topic: Soundscape perception.
2. Parameters to be analysed: auditory perception and acoustic comfort.
3. Targeted people: residents from Arab countries in comparison with the Turkish residents.
4. Acoustic Environment: Ankara, Turkey; considering the different areas and neighbourhoods.
5. Context: residential buildings, i.e. house.
6. Parameters considered: social and cultural background differences between the participating people.
7. Methodology: Questionnaire.

1.3. Basic Definitions

To understand the concept of this thesis, it is essential to be familiar with the basic and core terminology of the soundscape perception concept. Therefore, this section will review the definitions of the acoustic environment, soundscape, acoustic comfort and auditory perception, and establish the relationship between each one of them.

1.3.1. Acoustic Environment

As per the International Organization for Standardization, the term "Acoustic Environment" is defined as "sound at the receiver from all sound sources as modified by the environment" (ISO, 2013). This definition involves two basic elements, which are the sound resulting from natural or human sources, and the environment which modifies the sound until it reaches the receiver by amplification, absorption, reduction, mixing, etc.

1.3.2. Soundscape

As per the International Organization for Standardization, the "Soundscape" is defined as "acoustic environment as perceived or experienced and/ or understood by a person or

people, in context" (ISO, 2013). From the definition, it is understood that the way a person or a group people understand the acoustic environment within a certain context, e.g. residence, workplace, class environment, social event, plays a major role in determining the soundscape. Moreover, as it depends on an individual or group perception and experience, which involves the cultural and social factors of the people and the containing environment.

This understanding is supported in other literature sources, where soundscape is tied mainly to a physical place and its different characteristics, and the way its acoustic environment is perceived differently by different people. The many definitions and terms used to describe the concept of soundscape make it hard to understand. However, its principle relies on the acoustic environment concept and the way the affected people think about that acoustic environment according to their background (Brown, Kang, & Gjestland, 2011).

1.3.3. Acoustic Comfort

The acoustic comfort is a parameter standardized by building code requirement, measured in decibels, which sets the noise level in any space to a certain limit that empowers the functionality of the people in that space without disturbance (Brelih, 2013). Furthermore, the acoustic comfort for designers and urban planners is a parameter that should be considered while designing any development, which affects the layouts, material, and locations of the space to achieve the best functionality. Therefore, this parameter can be measured by an acoustic meter to measure the noise level in the space against the concerned code standards.

Nonetheless, one of the effective methods to measure the acoustic comfort is to compare the noise levels in the space from an acoustic meter with the subjective perception of the space users in order to establish the relationship between the numbers and the people's opinion (Crociata, Simone, & Martellotta, 2013), which is a methodology adopted in this research to acquire the most accurate results.

1.3.4. Auditory Perception

The auditory perception term is used widely in medicine, teaching and psychology. The term may mean the ability of a person "to identify, interpret and attach meaning to sound", or "the perception of sound as a meaningful phenomenon" as per medical terms and dictionary sources (Mnemonic Dictionary, 2009). Moreover, auditory perception is mainly tied to the psychological effects of the acoustic environment and the contributing sounds in understanding them by the human auditory system, which may vary from one person to another (Lotto & Holt, 2010).

The relation between the above terminologies can be expressed as illustrated by Figure 1 below.

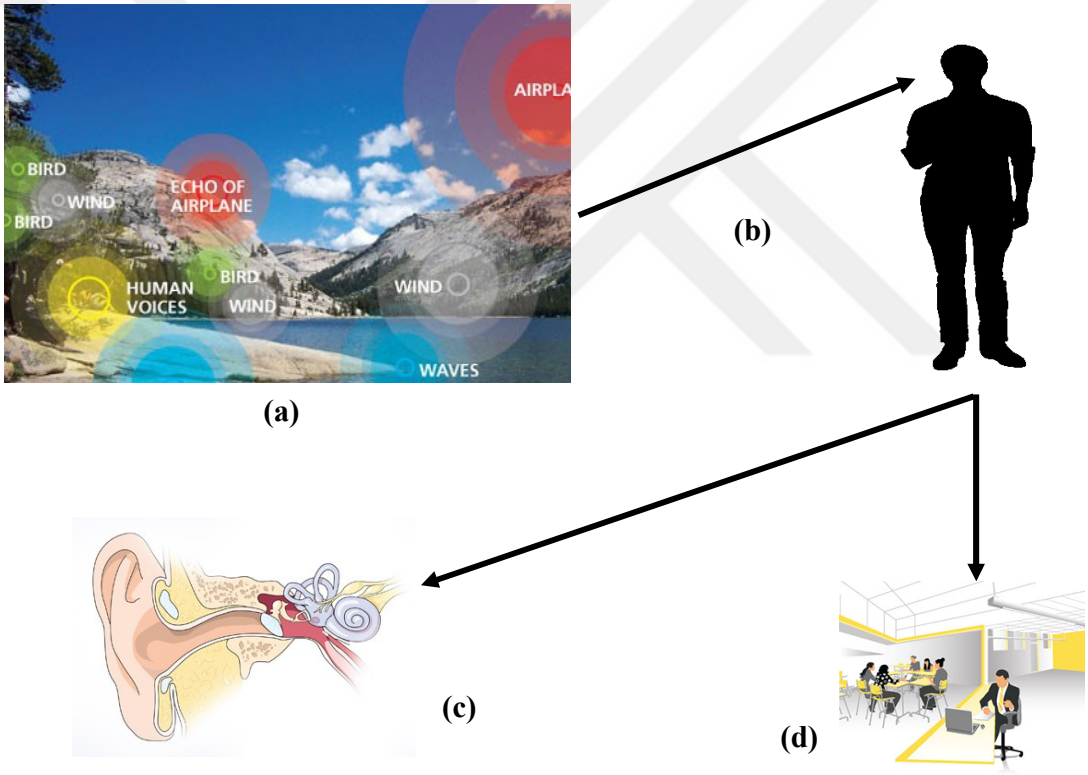

Figure 1.1. Relation between Acoustic environment, soundscape, acoustic comfort and auditory perception
(Framework by the researcher, images compiled from; Dybas, 2012; HearingLoss, 2011; Ecophon, 2014.)

a) Acoustic Environment: Sound modified by the environment
b) Soundscape: the way a person perceives an acoustic environment
c) Auditory perception: the sound variance from one person to another
d) Acoustic Comfort: noise level which empowers functionality of a space

1.4. Thesis Overview and Structure

This thesis is divided into five main chapters, where the first chapter is introducing the topic of the study, its aim and scope. Additionally, basic research terminologies are introduced and their interrelations are established. The second chapter is a read on the related and specialized literature to understand the practical use of the concept and the research made on the subject.

In the third chapter, a description of the study methodology is presented by introducing the objectives of the research, hypotheses and research questions. Moreover, the case space and the subject group are described to understand the background elements affecting the case study. Finally, the case study is designed, including the questionnaire, in order to gather as much of the differentiated factors as possible for this study. Furthermore, a narration of the questionnaire findings and measurements taken in Arab people's houses in Ankara are provided in the fourth chapter. A statistical analysis is performed in order to discuss results and compare them to similar studies. Finally, the fifth chapter includes the conclusions of the study, including recommendations and possible future research areas.

2. LITERATURE REVIEW

This chapter aims mainly to form the theoretical background for the study based on concepts and studies within the literature. Moreover, several subjects are discussed within the different sections including:

1. The concept of soundscape perception and its relationship with other concepts such as acoustic environment, acoustic comfort and auditory perception.
2. The literature coverage on the soundscape perception in residential contexts.
3. Factors affecting the acoustic comfort of the space users.
4. Evaluation factors for the quality of the soundscape.
5. Noise annoyance and its impacts on the wellbeing of the space users.
6. Soundscape enhancement strategies and their effectiveness in enhancing the acoustic environment.
7. Assessment criteria of the soundscape, acoustic environments through the previous studies.
8. Studies that have carried out in Turkey and Ankara in evaluation of the soundscape and acoustic environment in different contexts.
9. Reviewing the recorded acoustic environment of Ankara through its noise map in order to establish the discussion points based on the case study.

Therefore, keywords were chosen in order to ensure the coverage of all the related subjects within the research. Table 2.1 shows the literature matrix classifying the literature according to the study area.

Table 2.1. Literature Matrix

Keywords	Housing	Indoor Environment	Survey & Questionnaire
Soundscape Perception	(Yu & Kang, 2014) (Berglund, 2001)	(Kang, et al, 2016) (Lacey, 2014)	(Brown, et al, 2011) (Axelsson, et al, 2010) (Ozcevik, et al, 2012)
Acoustic Environment	(Schulte-Fortkamp, 2002) (Foale, 2014)	(Agnesod, et al, 2001) (Ma, et al, 2006)	(Miller, 2014) (Iwamiya, et al, 2001)
Acoustic Comfort	(Kuerer, 1997) (Fuchs, 2015)	(Fontczak & Wargocki, 2011) (Al horr, et al, 2016) (Crociata, et al, 2013) (Dokmeci & Kang, 2010)	(Bayazit & Ozbilen, 2016)
Noise Annoyance	(Whittle, et al, 2015) (Neitzel, et al, 2016)	(Cirillo, et al, 2003)	(Tunc Kurt, et al, 2016) (Su & Caliskan, 2007)
Environment Quality	(Mohamed, et al, 2014)	(Fadeyi, et al, 2014) (NSC, 2009) (Brelih, 2013)	(Frontzcak, et al, 2012)

2.1. Noise and Annoyance Studies

2.1.1. Auditory Perception

When studying the soundscape perception, it is not sufficient to look into the subject from the noise point of view. Resources show that with many noise reduction measures, the results of the acoustic comfort studies did not reflect the same impact in the same contexts. Therefore, the perception of the soundscape in any environment is dependent on the personal auditory perception of an individual and the interaction between the individual and the sounds (Kang & Zhang, 2010).

Furthermore, (Ismail, 2014) viewed the way different people perceive the soundscape in any environment, i.e. the hearing differences, as an essential factor that determines the perception element.

2.1.2. Acoustic Comfort

The acoustic comfort, as defined in the first chapter of this study, can also be defined for buildings as the capability of the space to protect the users from noise in order to provide a suitable acoustic environment to empower the space functionality (Al horr, et al.,

2016). Based on that, many studies have evaluated the acoustic comfort in different buildings and space types, where noise indices along with subjective questionnaire methodologies were used. In a study that measured the acoustic comfort indices and the satisfaction of the workers in a supermarket environment and established the correlations between them, the study confirmed that acceptable noise indices are strongly correlated to the satisfaction of the acoustic environment with correlation factors ranging between 1.0 and 0.88 ($R^2 > 0.5$) (Crociata, Simone, & Martellotta, 2013).

Moreover, in relating the acoustic comfort to any soundscape study, (Dokmeci & Kang, 2010) summarized the different affecting factors as shown in Figure 2.1, where sound identification, preference and change in exposure form the auditory perception towards the different sound sources. Furthermore, the subjective factors in the soundscape study also include the annoyance and its extent towards to different sound types. The third factor within this equation is the acoustic comfort, which is measured through the positive or negative effects of the sounds on the space users, in addition to the level of articulation and speed intelligibility in the space (Dokmeci & Kang, 2010).

The acoustic comfort is one of the most important elements that can affect the overall decision of the occupants to live in a certain neighborhood. In a questionnaire that was responded to by 471 participants in Germany, noise was the top factor in disqualifying nominated neighborhoods with 55% vote as a reason. Nonetheless, road and air traffic noise were the top sources of acoustic discomfort with 68% and 41%, respectively (Kuerer, 1997).

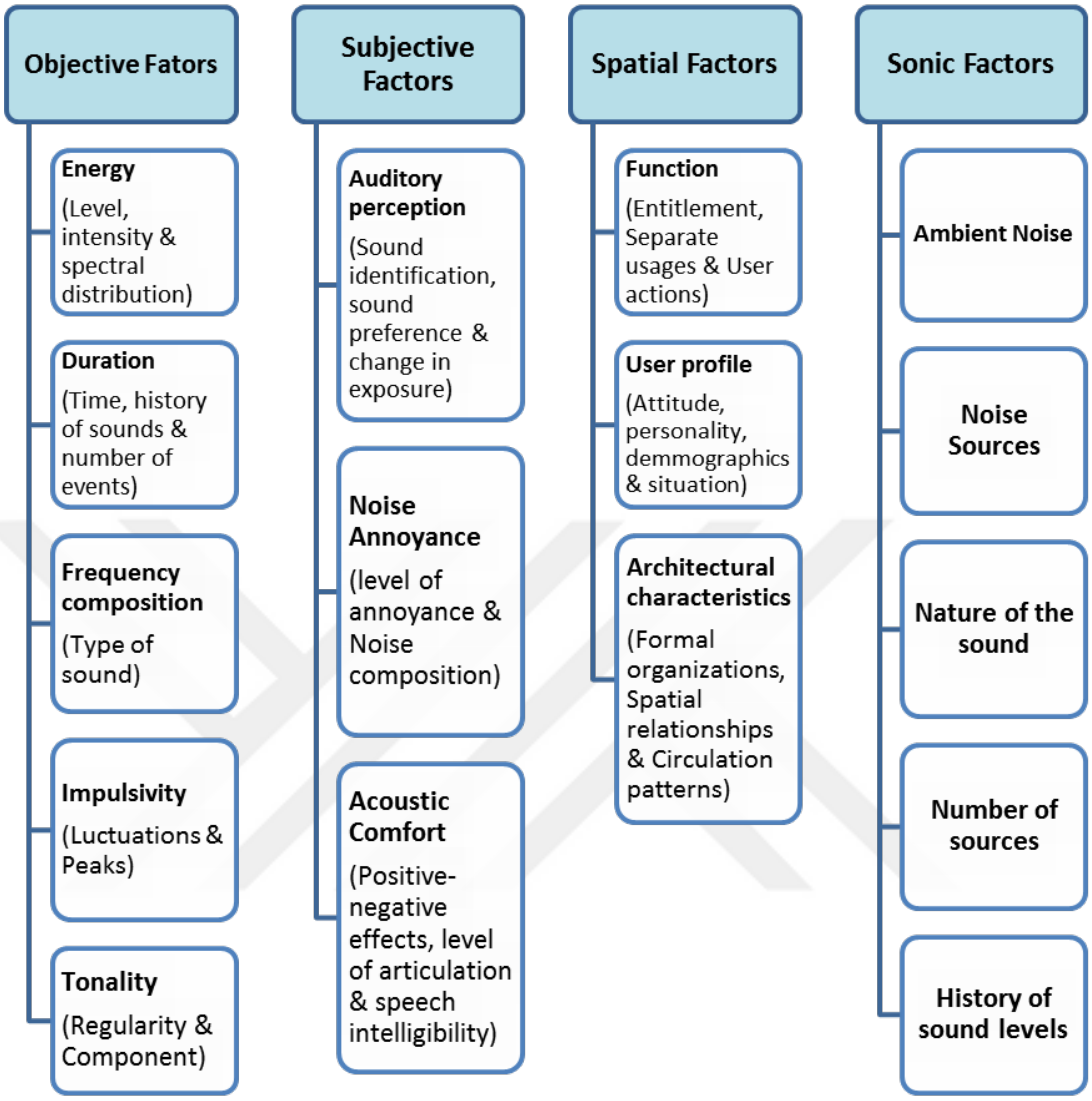

Figure 2.1. Acoustic comfort factors forming the soundscape study (Dokmeci & Kang, 2010)

2.1.3. Noise Sources and Wellbeing

There are many studies that confirmed the negative impact of noise on the wellbeing of the space users. Furthermore, studies also extended this impact to the ecosystem of the environment (Merchan & Diaz-Balteiro, 2013). Moreover, other studies focused on the impacts on the human inhabitants and indicated the effect of the noise on the productivity and comfort on them (Ismail, 2014).

Furthermore, resources confirm that the impact of noise, acoustic environment and soundscape have impacts on the social, psychological and health factors of the urban inhabitants. The same results are supported by many reports from the World Health Organization (Rey Gonzalo, Trujillo Camona, Barrigon Morillas, Vilchez-Gomez, & Gomez Escobar, 2015). In other more generic studies, the acoustic comfort, as one of the different indoor environmental quality factors, was found to be influential in achieving less stress and overall health benefits (Al horr, et al., 2016).

2.2. Soundscape Studies

In the literature, the concept of soundscape is a wide context and thereby is hard to contain the field within a certain research approach. Nonetheless, the perception of the soundscape is one of the known ways to understand the nature of the acoustic environment and the noise level within that environment. Therefore, when measuring the soundscape perception, it is important to consider the view point of the people towards the different sounds, which relates assessing the soundscape evaluation directly to the assessment of the sounds (Davis, et al., 2013).

During the past century, the fast changes in the urbanization, mainly due to the industrial revolution, imposed many differentiations on the soundscape and the acoustic environment of most of the cities around the world (Rey Gonzalo, Trujillo Camona, Barrigon Morillas, Vilchez-Gomez, & Gomez Escobar, 2015).

Botteldooren et al. (2008), provided an understanding of the various factors that affect the soundscape perception, which is mainly influenced by the way humans interact with their environment. Therefore, the acoustic or sonic environment of the urban space becomes an input within many other factors that influence the perception of each person. Figure 2.2 presents the many factors that are human related and can affect the soundscape perception.

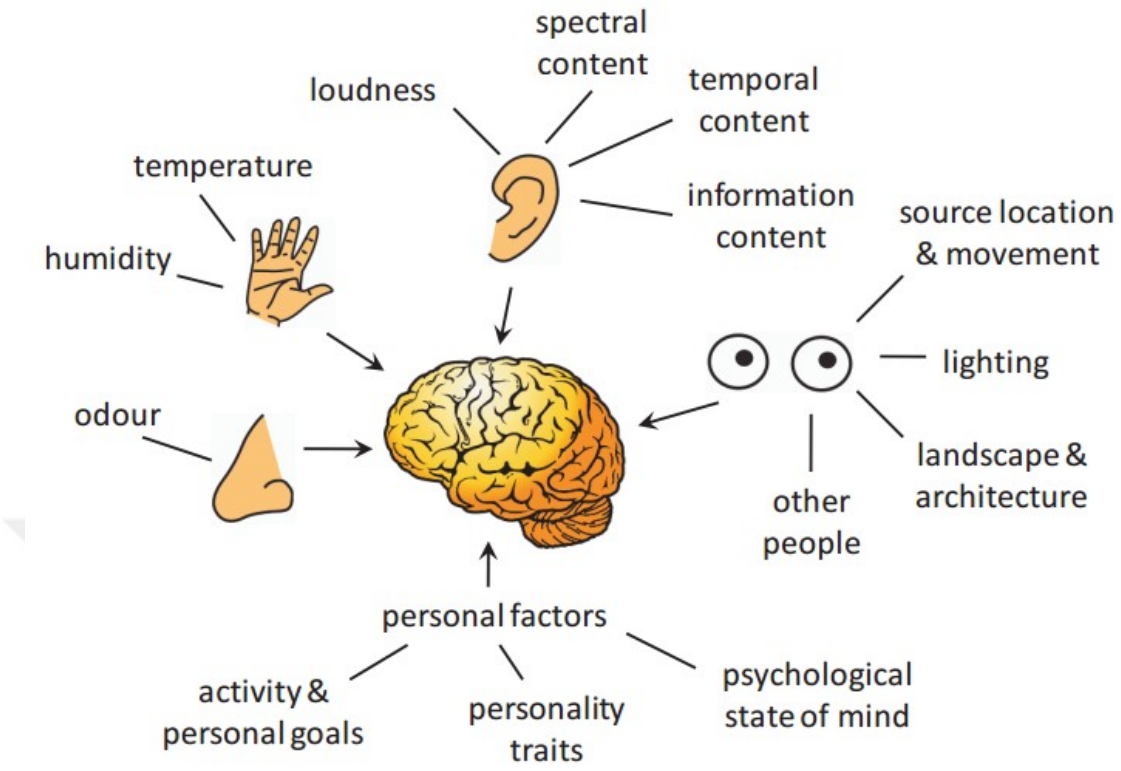

Figure 2.2. Factors affecting soundscape perception aside from the sonic environment (Botteldooren, De Coensel, Van Renterghem, Dekonninck, & Gillis, 2008)

2.2.1. Soundscape Quality

The first study involving the study of the soundscape perception was conducted in 1930 by Edward Brown and his fellow scientists in New York, where the study confirmed in the current urban context, the soundscape is not limited to the human and ecological sound sources. This study considered other factors in evaluating the soundscape beside the sources such as its presence, location and effect on people (Ismail, 2014). Furthermore, other scientists categorized the sounds according to the sources as shown in Table 2.2 below.

Table 2.2. Categorization of sounds according to their sources by Murray Schafer (Ismail, 2014).

Natural Sounds	Water	Ocean, Seas and Lakes Rain Rivers Streams Snow
	Air	Wind
	Earth	Trees
	Birds	Sparrows
	Insects	Flies
	Seasons	Spring
Human Sounds	Voices	Speaking
Society Sounds	Town, urban, factories, parks, schools, Siren	
Mechanical Sounds	Machine, car, airplane, trucks, construction	
Silence		
Indicators	Bell, horns, telephones	

Furthermore, in a study that aimed to standardize the soundscape assessment, (Brown, Kang, & Gjestland, 2011) focused in their process on two main factors. The first factor is, 'the outcome from the soundscape quality study'. This factor includes the impact or perception of the sounds in addition to the context of the study. The perception of the sounds is categorized according to the study as shown in Table 2.3 below. However, the context includes the place or the location, dimensions of the physical environment, the functionality of the space, and the amount of exposure of the studied group of people to the soundscape of the context.

Table 2.3. Standardized perceptions of the soundscape (Brown, Kang, & Gjestland, 2011).

Acceptability	Identification of place	Relaxation
Appropriateness	Importance	Safety
Clarity	Information	Satisfaction
Comfort	Liveliness	Sense of control
Communication	Naturalness	Solitude
Enjoyment	Nature appreciation	Tranquility
Excitement	Nostalgic attachment	Uniqueness
Happiness	Peacefulness	Variety
Harmony	Place attachment	Well-being

The second factor is, ‘place and sources’. This factor is directly related to the acoustic environment of the study place. The research gives a huge significance to the context as it affects classifying the soundscape into a background and foreground depending on it. In order to standardize the place and the sources, the research took into consideration and outdoor urban environment as classified the sources as seen in Figure 2.3 below.

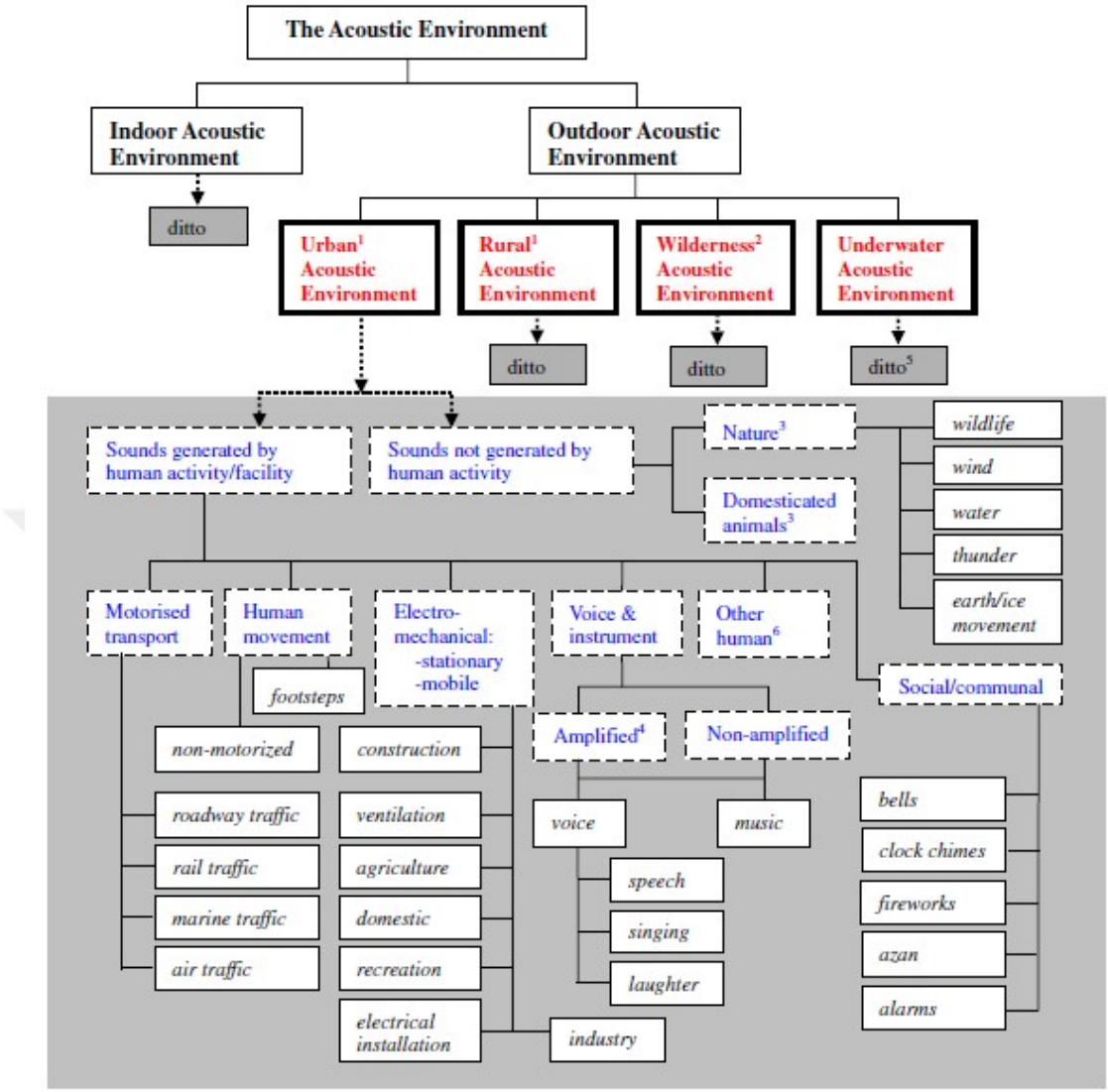

Figure 2.3. Place and sound sources standardization

(Brown, Kang, & Gjestland, 2011)

Moreover, in reviewing the types of sounds that were used in different studies, (Yu & Kang, 2014) divided the sound types in the research into natural and artificial sounds in their pursuit to figure out the cross-cultural differences in the acoustic environment between the British and Taiwanese living environments.

The results of the study show that both living environments' inhabitants preferred similar sound types, where quiet was voted the most preferred natural sound and music

was voted the most preferred artificial sounds, in both case studies. Nevertheless, the comparison between the two cultures shoes that the Taiwanese participants had higher evaluation (means) for the sound quality in the living area and their houses, while they had higher, annoyance and sleep disturbance means to the different sound sources (Yu & Kang, 2014).

2.2.2. Soundscape in Residential Contexts

The soundscape, acoustic environment, and acoustic comfort have been examined in several contexts around the world. However, as this research is targeting the residential settings in Ankara, reviewing the affecting parameters and the results in studies that are concerned with houses and the living environment is the most relevant for this thesis. The previous studies mostly examined the overall indoor environmental quality of the house environment, of which the acoustic comfort forms one of four elements; thermal comfort, acoustic comfort, air quality and visual comfort (Fadeyi, Alkhaja, Bin Sulayem, & Abu-Hejleh, 2014).

Moreover, in a study that examined the acoustic comfort as part of the indoor environmental quality parameters with the Danish house settings, the acoustic comfort showed a 0.52 correlation factor with the acceptability of the living environment. Furthermore, 62% of the 645 participants indicated that the acoustic comfort has an equal importance or more than thermal comfort, visual comfort and air quality (Frontczak, Andersen, & Wargocki, 2012).

In another study that was performed on low cost houses in Malaysia, 29% of the 45 questionnaire participants expressed their dissatisfaction from the acoustic environment of their houses, 45% expressed their neutrality. This study examined the acoustic comfort as part of the indoor environmental quality elements (Mohamed, Yusoff, Pratama, & Raman, 2014). Nevertheless, the studies that cover the soundscape perception in residential settings are limited within the literature, which is the gap that this research is aiming to fill.

2.2.3. Soundscape Improvement

The goal of studying the soundscape in any context is to improve it by altering the affecting factors. Therefore, in a study by (Jennings & Cain, 2013), an improvement framework was proposed under three parts and an implementation strategy. Regarding the soundscape components, the sounds and its sources are the objective of the framework. Thus, controlling the loudness, sharpness and variety of the sounds can affect the overall soundscape. Figure 2.4 below illustrate the first part of the framework.

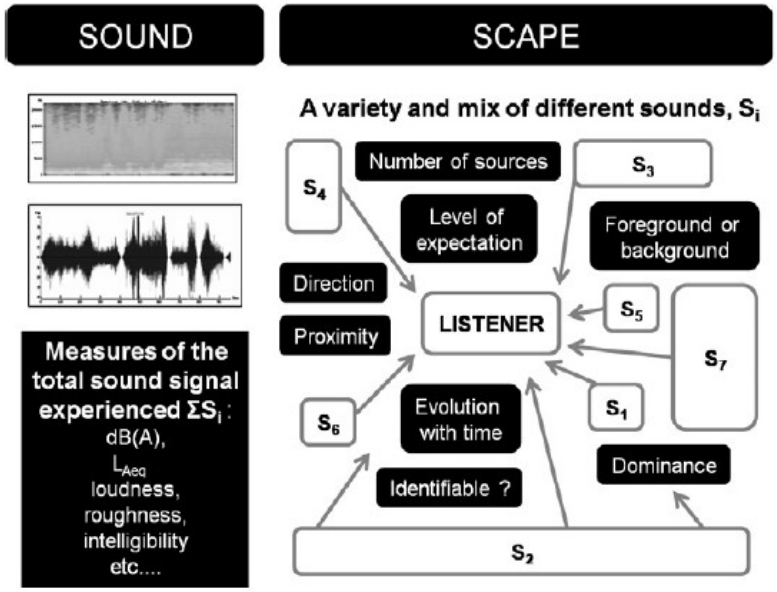

Figure 2.4. Impacting the soundscape by the altering the sounds (Jennings & Cain, 2013).

The second part focuses on perception. This part classifies the listening types into three categories; listening in search, which is a focused listening type similar to listening to a person that is talking to you, listening in readiness, which describes recognizing a certain sound when the person's attention is somewhere else, and Background listening, which is the type where the concentration of the person is on a main activity while hearing other sounds in the background. Therefore, this part identifies the influencers of the perception as illustrated in Figure 2.5 below. Furthermore, a design, measures or semantic intervention to impact this element may have a huge impact on occupants' place identification or the activities performed within the space as shown in Figure 2.6 below.

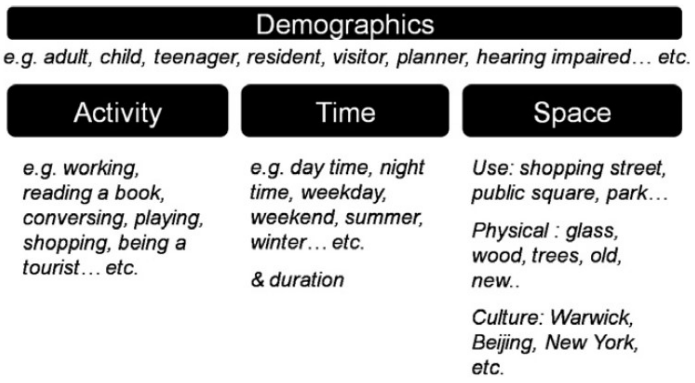

Figure 2.5. Perception influencers by

(Jennings & Cain, 2013)

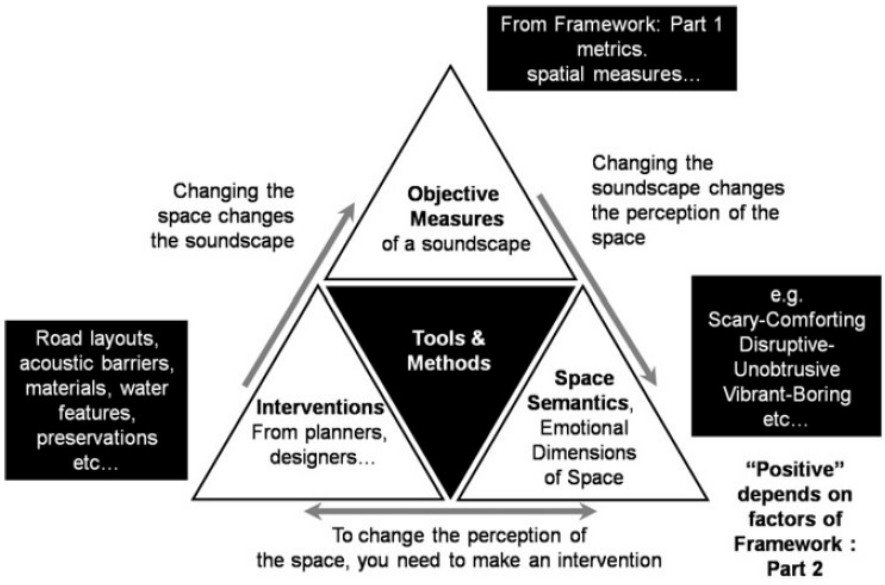

Figure 2.6. Impact of intervention on soundscape perception

(Jennings & Cain, 2013)

The third one is, engagement and Kano model. Due to the complexity of the subject and the several components that affect it, the researchers applied the level of engagement of the space users to the Kano model, which shows a qualitative evaluation of a product or a service through three main components; performance requirements, basic requirements and excitement requirements. Figure 2.7 below shown the Kano model that illustrate the three requirements.

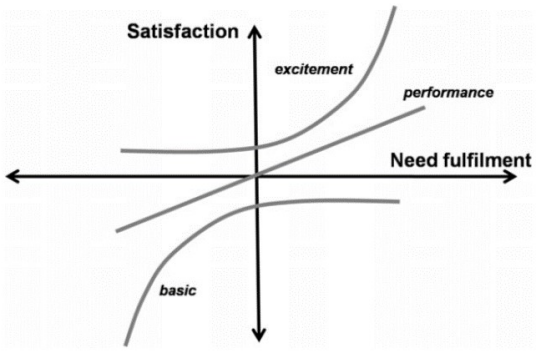

Figure 2.7. Kano model for products or services requirements
(Jennings & Cain, 2013)

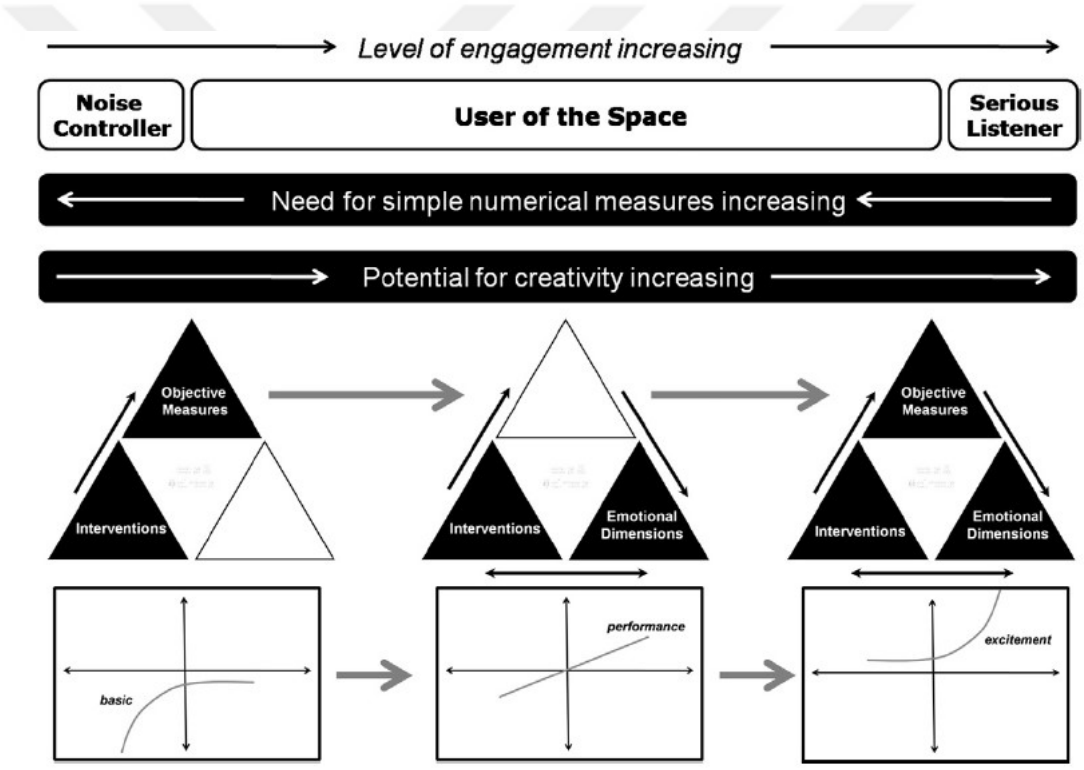

Figure 2.8. Soundscape improvement model
(Jennings & Cain, 2013)

By incorporating the three parts of the soundscape perception improvement study, Figure 2.8 above shows that evaluation, intervention and noise controllers can impact the positivity of the soundscape perception. In the literature, the abovementioned steps are a complete framework in altering the soundscape in a certain environment, which

can be used to increase its positivity. Therefore, such as strategy would be beneficial in developing the discussion and recommendations for the case study of this research in order to enhance the soundscape perception of the residents based on their cultural backgrounds.

2.3. Assessing Soundscape Perception

For the benefit of the research, it is essential to establish the soundscape and acoustic environment assessment criteria and factors in order to design the research through a comprehensive method based on the literature. Therefore, this section reviews the approaches adopted by the literature in studying the soundscape perception and acoustic environment, in addition to comparable results from significant studies.

In a study that measured the acoustic environment in Italian buildings, i.e. offices, the researchers evaluated the noise indices through direct measurement, however, a questionnaire methodology was adopted for the space users in order to assess the annoyance from the different sound sources. Therefore, the study performed a questionnaire on 589 space users deploying satisfaction and dissatisfaction scales in order to understand the perception their perception to the sound sources. While the study also carried out measurements to correlate them to the loudness perception, the results indicate a strong correlation between the two methodologies (Ayr, Cirillo, Fato, & Martellotta, 2003).

Furthermore, Rey Gonzalo et al. (2015) highlighted that there are three main approaches in studying the acoustic environment and the soundscape, which are divided into three main categories:

1. Physical approach: comparing the standard and reference sound level values to the actual values of the sound levels in a certain space. This approach provides an accurate measure of the sound level but not necessarily the psychological effects and the perception of the users.
2. Psychological approach: correlating the acoustic environment to the human sensation and the way people respond to the different sounds and their levels,

which means that the impacts of the acoustic environment and the soundscape are measured through users' annoyance and disturbance.

3. Perceptual approach: which is the most recently adopted approach in this field, measuring the way people perceive the sounds in the acoustic environment, whether positively or negatively.

Therefore, the results of the research performed in Rey Gonzalo et al. (2015) shows a strong relation between the subjective and objective parameters through the three approaches, except the correlation between the subjective variables and soundscape characters, which showed a weaker correlation.

Moreover, on assessing the soundscape through a questionnaire methodology, a British study that involved 762 university students, distributed unevenly on different targeted sites, used descriptive adjectives to evaluate the overall soundscape of urban spaces. The adjectives included the following criteria (Kang & Zhang, 2010):

1. Impact of the sounds on the participants (agitating to calming)
2. Comfort of the sounds
3. Focus of the sounds (Directional to everywhere)
4. Sounds' effects (echoed to deadly)
5. Distance to the sounds' sources
6. Likability of the sounds by the participants
7. Pleasantness implied by the sounds.

The study then analysed the factor on seven rates scaling for each adjective category in order to correlate them to the different locations and age groups (Kang & Zhang, 2010). Moreover, other studies focused their soundscape perception evaluation on the people's preferences towards the sound sources by including choices such as loud positive and loud negative for the same sound source (Ismail, 2014).

Since the research within this thesis involves the cross-cultural comparison between the Turkish residents of Ankara in comparison with the Arab residents, it is beneficial to

review similar studies performed in comparison between two cultures. The previously reviewed study of Yu & Kang (2014), which compared the soundscape perception between the British and Taiwanese living environments, the results showed a higher satisfaction of the soundscape in the Taiwanese living environment over the British living environment, especially in the third stage of the study, by showing higher means for satisfaction of the living environment, sound quality in the living area, and sound quality of the houses (Yu & Kang, 2014). Such results indicate that different cultures have different perception of sounds, annoyance levels and preferences depending on the cultural background. While Yu & Kang (2014) compared the two cultures based on their home cities, Sheffield in UK and Taipei in Taiwan, the present study elaborates on this concept by comparing the soundscape perception based on the cultural differences within the same city.

Furthermore, the studies show that choosing the sound sources for a soundscape study is important in order to get an accurate perception of the different types. In a study that examined the soundscape perception of the inhabitants of French cities towards several sound sources and the number of occurrences of every sound, the results show that natural and bird sounds were the most occurring positive natural sounds, while cars, traffic and angry people were of the most occurring negative sounds (Guastavino, 2006).

2.4. The Acoustic Environment and Soundscape in Turkey

The studies performed to evaluate the soundscape in different part of Turkey were performed through physical and perceptual approaches, where some of them adopted a sole or mixed subjective evaluation.

In a study that evaluated the soundscape in four public areas of Istanbul; Beşiktaş Pier Square, Ortaköy Pier Square, Bağdat Street, and Barbaros street, the researchers examined the subject through two main methodologies; sound recording description of each case, in addition to a questionnaire survey of the users of each case (Ozcevik & Yuksel Can, 2012). Through sound recording description, the researchers anticipated the satisfaction of the users as shown in Table 2.4 below.

Table 2.4. Sound recordings description in Istanbul Study (Ozcevik & Yuksel Can, 2012)

Case Study	Sound Recording Description	Expected satisfaction outcome
Beşiktaş Square	Land and sea transportation noise Wind and sea sounds Birds sounds Commercial sales voices	Unsatisfactory
Ortaköy Square	Sea transportation noise Sind and sea sounds Birds sounds Shopping people sounds Prayers calling (Azan) Commercial sales voices	Satisfactory
Bağdat Street	Land transportation noise Children's voices Music Shopping people sounds	Unsatisfactory
Barbaros Street	High traffic noise Siren sounds Peoples' voices	Unsatisfactory

Furthermore, the study proceeded in performing a questionnaire of the user's opinions in each of the for public spaces, where they used 30 contradicting pairs of adjectives to describe the acoustic environment in each case. The results of the survey supported the sound recordings expectations. Nonetheless, the sounds that mainly contributed into these results were the traffic noises, which were considered not favoured by the users. However, the people voices, even resulting from commercial sales, were considered as acceptable. Moreover, the absence of natural sounds, as of the case of Bağdat street, contributed into considering the soundscape of the area as unsatisfactory (Ozcevik & Yuksel Can, 2012).

Furthermore, another Turkish study used a mixed subjective methodology in evaluation of the acoustic environment pleasantness, and its correlation to sound quality indices, through recording 27 soundtracks from a sound environment of a public urban space in the city center of Diyarbakir. Thereafter, these recordings were analyzed in terms of loudness, sharpness and roughness before introducing 53 participants to judge each

soundtrack's pleasantness (Cakır Aydın & Yılmaz, 2016). Based on the judgement results, the researcher established Pearson's correlation coefficient between the three sound quality indices and the pleasantness of the sounds as illustrated in Figures 2.9, 2.10 and 2.11 below, where an inverse proportional relationship is established between the studied parameters.

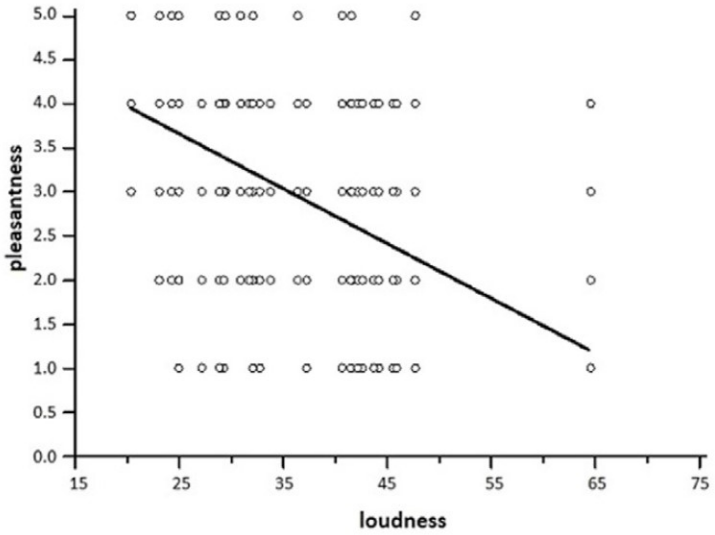

Figure 2.9. Correlation between loudness and pleasantness (Cakır Aydın & Yılmaz, 2016)

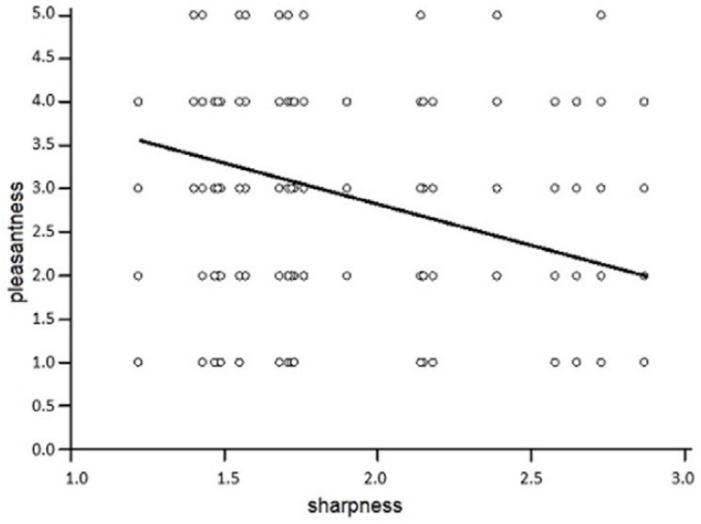

Figure 2.10. Correlation between Sharpness and pleasantness (Cakır Aydın & Yılmaz, 2016)

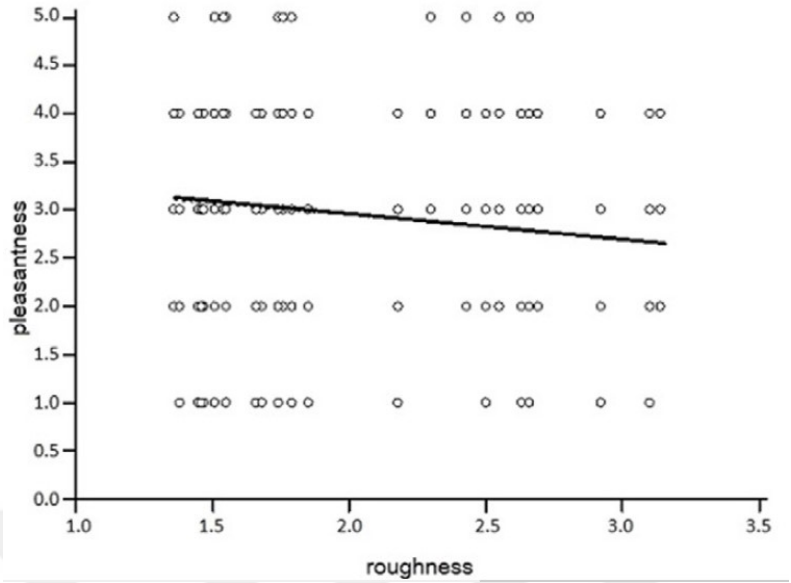

Figure 2.11. Correlation between roughness and pleasantness (Cakır Aydın & Yılmaz, 2016)

3. METHODOLOGY

3.1. Research Questions

The main research question is how do the cultural and social factors affect the soundscape perception of the Arab residents in Ankara, compared to the Turkish residents of the city?

Thus, several questions shall be asked in order to answer the main research question:

1. How does demographical differences and residential environment variations affect factors such as; importance, satisfaction level, overall soundscape evaluation and sound source perception?
2. What are the variations on the importance given to the acoustic environment by the Arab and Turkish people living in Ankara?
3. What are the variations on the satisfaction levels from the acoustic environment of Arab and Turkish people living in Ankara?
4. What is the overall soundscape perception of the Arab and Turkish people in their houses?
5. How do the Arab residents evaluate the sound source loudness in their house in comparison to the Turkish residents?
6. What are the sound sources that are frequent in Ankara according to the perception of the Arab and Turkish residents?
7. What are the sounds favoured by Ankara's Arab residents in comparison to the Turkish residents?

3.2. Objectives

The main aim of this thesis is to study the difference in soundscape perception between the Arab residents and Turkish residents of Ankara, Turkey, by analyzing the auditory perception and acoustic comfort of both groups within their houses in the city; considering their cultural and social backgrounds, evaluated through the nationality, age

and educational backgrounds of the study participants. Therefore, the objectives of this study are as the following:

1. Understand the definitions and concepts of soundscape perception, acoustic environment, acoustic comfort and auditory perception.
2. Study the applications of soundscape and acoustic environment perception surveys and questionnaires, and design a residential soundscape perception questionnaire.
3. Perform a subjective assessment of the residential soundscape perception of the Arab and Turkish residents through questionnaire method.
4. Study the cultural and social backgrounds of the Arab and Turkish residents in Ankara through a theoretical understanding of their factors in correlation with the questionnaire results.
5. Compare the questionnaire results of the Arab and Turkish residents of Ankara to establish the differences based on the cultural and social similarities and differences in addition to the specific soundscape perception questions.
6. Establish correlations between the cultural and social parameters of the participants and their soundscape perception of the acoustic environment of their house setting in Ankara.

3.3. Hypotheses

Based on the study objectives, the hypotheses of the study are as the following:

H1: The importance given to the sound environment of the houses in Ankara depends on the cultural background of the perceiver.

H2: The overall satisfaction of the sound environment of the residential context depends on the cultural background of the perceiver.

H3: The overall soundscape perception of the acoustic environment within the residential context depends on the cultural background of the perceiving group.

H4: There is a correlation between the perception of the sound source loudness and the cultural background of the perceiver.

H5: There is a correlation between the perception of the sound source frequency of occurrence and the cultural background of the perceiver.

H6: There is a correlation between the favourability sound source and the cultural background of the perceiver.

H7: The importance given to the sound environment of the houses in Ankara depends on the demographical changes such as gender, education level and occupation.

H8: The importance given to the sound environment of the houses in Ankara depends on the residential environment changes.

H9: The overall satisfaction of the sound environment of the residential context depends on the demographical changes such as gender, education level and occupation.

H10: The overall satisfaction of the sound environment of the residential context depends on the residential environment changes.

H11: The overall soundscape perception of the acoustic environment within the residential context depends on the demographical changes such as gender, education level and occupation.

H12: The overall soundscape perception of the acoustic environment within the residential context depends on the residential environment changes.

H13: There is a correlation between the perception of the sound source loudness and the demographical changes such as gender, education level and occupation.

H14: There is a correlation between the perception of the sound source loudness and the residential environment changes.

H15: There is a correlation between the perception of the sound source frequency of occurrence and the demographical changes such as gender, education level and occupation.

H16: There is a correlation between the perception of the sound source frequency of occurrence and the residential environment changes.

H17: There is a correlation between the favourability sound source and the demographical changes such as gender, education level and occupation.

H18: There is a correlation between the favourability sound source and the residential environment changes.

3.4. Case Characteristics and Evaluation Factors

3.4.1. Context Characteristics

In studying an urban environment like Ankara, there are many characteristics to be reviewed ahead of establishing a soundscape study. The big city of Ankara consists of 24 areas and municipalities as shown in Figure 3.1 below.

Figure 3.1. Big Ankara areas and municipalities
(World Map, 2016)

Moreover, the population in Ankara is estimated to be 5, 346.518 as of 2016 (TurkStat, 2017). Nonetheless, the density of this population is concentrated around the centre and the North of the centre as illustrated by Figure 3.2 below.

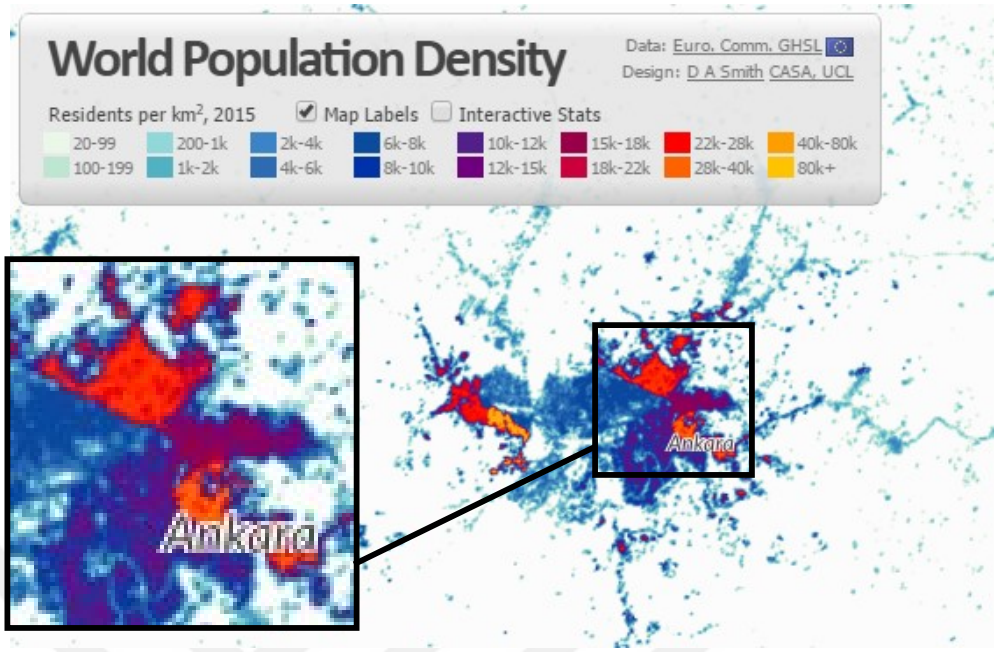

Figure 3.2. Ankara population density illustration
(LuminoCity, 2017)

Furthermore, Ankara has one major civil airport, which is located at the far Northern East of the big city within the Cubuk district, in addition to few small and military airports directed towards the outskirts of the city. However, there are several main highways that connect the different parts of the City as shown in Figure 3.3 below.

Figure 3.3. Ankara's airport and major highways
(World Map, 2016) (URL provided in references)

The urbanization of the city is focused in the city center at the areas of Çankaya (17.2%), Mamak (11.7%), Keçiören (16.9%), and Yenimahalle (12.1%), while the density of urbanization starts to decrease towards the outside of the city. Moreover, the industrial areas of the city are mainly distributed around the outskirts of the city in the form of Organized Industrial Zones (OIZ) (Ankara Development Agency, 2015).

3.4.2. People Characteristics

There are 22 countries, which Arab people are originally from as shown in Figure 3.4 below. The wide spread of the Arab world increases the diversity of cultural, social and environmental backgrounds. However, these differences are emerging from the geographic location, political separations and diversity of cultures and religions. The areas that are close to Turkey such as Lebanon, Syria, Palestine and Egypt share a lot of the social and cultural aspects with their Turkish counterpart due to the huge governance of the Ottoman empire over more than 600 years of these areas. Moreover, countries like Libya, Tunisia, Algeria and Morocco have Northern African cultural backgrounds, which are either European or Amazigh influenced cultures. The South-Eastern part of the Arab World has mainly a Bedouin, African or Persian influencing factors.

Figure 3.4. The Arab World map

(JUPCO, 2017)

According to non-official statistics, there are 540,245 Arab residents in Ankara, which forms 11.74% of the total big city population (TWSAS, 2016).

3.4.3. Evaluation Factors

In this study, the evaluation factors of the soundscape perception of the Arab residents in Ankara are mainly falling under the following categories:

1. Cultural and social factors: which are evaluated through the original countries of the study participants, in addition to their age, gender and occupations during their stay in the city. The cultural and social information is mainly depending on the information provided about each country and population, which are used through the results discussion of this thesis.
2. Residential environment factors: which are evaluated through the area the participants are residing in, in addition to their houses' characteristics in terms of type and floor.
3. Acoustic environment and soundscape factors: these factors are constructed in within the questionnaire designed for the study, where the acoustic comfort, auditory perception and soundscape perception are evaluated. Moreover, the results of the questionnaire are compared to previous study results and the established acoustic environment of Ankara.

3.5. Questionnaire Design

The questionnaire, template attached in (Appendix A), is designed as three main parts, which are demographics, residential environment, and soundscape perception and acoustic environment evaluation. A full version of the questionnaire is provided in English as (Appendix A). Nonetheless, for the convenience of the participants, Arab and Turkish versions are translated by professional translators in the control of the researcher and supervisor and applied through internet questionnaire delivery platform.

3.5.1. Demographics

The demographic information of the questionnaire participants include five questions, as follows:

1. Gender: two choices Male and Female

2. Age Category: divided under six categories; below eighteen, eighteen to twenty-five, twenty-six to thirty-five, thirty-six to forty-five, forty-five to sixty, and sixty years and above.
3. Occupation: Five choices are provided; Student, housewife, working person, retired and other.
4. Education Level: Six options are provided; elementary school, middle school, high school, university, master's degree, and doctoral degree.
5. Nationality: the selection of these nationalities was based on the researcher's expectation of the most Arab nationalities that are residing in Ankara. Therefore, 8 choices were provided as; Libya, Syria, Iraq, Egypt, Jordan, Palestine, Saudi Arabia and Algeria. In addition, 'other' option is also provided for participants that are from other countries, which are not identified in the list.

Each of these factors is established for the purpose of correlating the questionnaire results to the cultural and social factors that are provided through these elements.

3.5.2. Residential Environment

The second part of the questionnaire is designed to understand the housing types and the living trends of the participants. Therefore, this section includes six questions, as follows:

1. The period the participant has been living in his or her current house: four choices are provided in years; zero to one, one to five, five to ten, and more than ten years.
2. House type: Five choices are provided according to the general house types in the city; detached house, attached house, terraced house, apartment, and other. If the participant's answer is "apartment", he or she will continue to the next question, otherwise, the participant is directed to the fifth question in this section.
3. Floor location: this question is answered by the participants who choose "apartment" in the previous question. Moreover, this question provides four answers; basement, ground floor, intermediate floor, and top floor. If the

participant's answer is "intermediate floor", he or she will continue to the next question, otherwise, the participant is directed to fifth question in this section.

4. Floor Number: this question is answered by the participants who choose "intermediate floor" in the previous question, where a drop list of the floor numbers is provided.
5. Living area: All participants answer this question with a choice from the main areas of Ankara, however, to ensure that only the residents of Ankara Participate in this questionnaire, a choice of "I don't live in Ankara" is provided, which direct the participant to a disqualification page.
6. Periods of time spent in the house: the participants are provided with four time slots; morning (06:00 to 12:00), afternoon (12:00 to 18:00), evening (18:00 to 24:00), and night (24:00 to 6:00), where the participants were asked to sort them from 1 (the longest period) to 4 (the shortest period).

The purpose of this section is to correlate the house type, floor, area and time periods to the participants' soundscape perception, which provides the basis to establish scientific discussion points on the soundscape and acoustic environment parameters related to these factors.

3.5.3. Soundscape Perception and Acoustic Environment

This section includes six questions in order to evaluate the soundscape perception of participants. The scales chosen for each question are even so a forced-choice method is applied in the design of the answers scales and all participants are therefore forced to determine a tendency in the scale for each question and sound source, as follows:

1. Importance of the sound environment: the participants are asked to indicate the importance of the sound environments of their houses to them through the Likert scale of four options as; very important, important, unimportant, and very unimportant.
2. Sound environment overall satisfaction: the participants are asked to indicate their overall satisfaction of the sound environments of their houses in Ankara through the Likert scale of four options as; Very satisfied, satisfied, dissatisfied, and very dissatisfied.

3. Acoustic environment description by identified adjectives: eight semantic adjective pairs were identified from the previous soundscape studies in the literature for this question including an extreme description of each pair; Quiet-Noisy, Good-Bad, Pleasant-Unpleasant, Peaceful-Stressing, Comfortable-Uncomfortable, Positive-Negative, Favourable-Unfavourable, and Calm-Agitating.
4. Sound source loudness evaluation: twenty-two sound sources (Table 3.1) are selected as categorized or classified in the previous soundscape studies in the literature to provide a comprehensive list of all the possible sounds in a house setting. The participants are asked to evaluate the loudness of each sound source on a four scale in addition to N/A (not applicable) choice worded as 'I don't hear it'. The four scales to be considered are; very low sound level, low sound level, high sound level, and very high sound level.
5. Sound source frequency of occurrence evaluation: the same twenty-two sound sources (Table 3.1) that are used in the sound source loudness evaluation are also used for this question. The participants are asked to evaluate the frequency of occurrence for each sound source on a four scale in addition to 'sound does not occur' option and the main rating scale as; very infrequent, infrequent, frequent, and very frequent.
6. Sound source favourableness evaluation: twenty-two sound sources (Table 3.1) are chosen to provide a comprehensive list of all the possible sounds in the city. The participants are asked to evaluate the favourableness of each sound on a four scale; very favourable, favourable, unfavourable, and very unfavourable.

The aim of this section is to evaluate the overall soundscape perception of the participants, in addition to the loudness, frequency and favourableness of the sounds, which would define the acoustic environment of Ankara and the perception of the participants of these sound sources. A list of the sound sources is provided as part of the questionnaire template in Appendix 1. Moreover, the outcomes of this section are correlated with the factors in sections 1 and 2 of the questionnaire.

Table 3.1. Sounds used in the case study

Number	Sound Description
1	Planes, jets, and helicopters that are passing by
2	Trains or subway trains that are passing by
3	Motorcycles, cars, buses, and trucks that are passing by
4	Horns from vehicles
5	Police/ambulance sirens
6	Nearby schools (children shouting, bells, etc.)
7	Religious sounds (azan, church bell, etc.)
8	Shutters of shops / markets
9	Nearby Construction
10	People on the street (talking, walking, etc.)
11	Domestic equipment in your house
12	Talking, shouting in your house
13	Movement in your house (walking, furniture, doors)
14	Neighbours talking, shouting
15	Neighbours' domestic equipment
16	Neighbours' movement (walking, furniture, doors)
17	Drainage systems/water pipes
18	Rain
19	Wind
20	Domesticated animals (cats, dogs, birds, etc.)
21	Street animals (dogs, cats)
22	Urban birds

3.6. Sample and Analysis

Considering an Arab population of 500,000 and a Turkish population of 4,500,000, the targeted sample size is initially set as 385 questionnaires, which achieves a confidence level of 95% and increase the reliability of the data. Moreover, the total targeted number of questionnaires are divided evenly, to the closest extent, between the Arab and Turkish participants of the questionnaire establishing the experimental and control groups, respectively. The questionnaire had been prepared and sent by using an online survey tool through random data sampling method for both the Arabic and Turkish residents of

Ankara. A total of 475 questionnaires are sent for this study and 418 completed questionnaires are received from the system.

Based on the received sample of 418 questionnaires, the final qualified sample is 405 questionnaires divided to 201 and 204 questionnaires for the Arab and Turkish residents of Ankara, respectively. Residents that live outside of Ankara have been disqualified from the analysis. Based on the questionnaire design and sample size, the Cronbach's alpha is calculated as 0.934, which is considered high and empowers the reliability of the study and its results. Thereafter, the data is entered into SPSS Statistics and analyzed to understand the soundscape perception of the Arab and Turkish residents of Ankara.

4. FINDINGS

This chapter provides the findings of the case study, the statistical analysis and the comparison between the two study groups, Arab and Turkish residents of Ankara. Moreover, the correlation between the assessments of Ankara residents for the soundscape of the city is correlated to their cultural and social backgrounds. The results of the study are further compared to studies from the literature.

4.1. Descriptive Findings

This section describes the results of the study according to the designed questionnaire. The division of the findings follows the questionnaire division into three main sections; demographics, residential environment, and soundscape perception and acoustic environment evaluation.

4.1.1. Questions on Demographics

The genders of the participants of the questionnaire are divided into 238 males and 167 females for the full sample, percentages are shown in Figure 4.1. For the study groups, the Arab group has a distribution of 65.7% and 34.3% for males and females, respectively, while the Turkish group has a distribution of 52% and 48% for males and females, respectively.

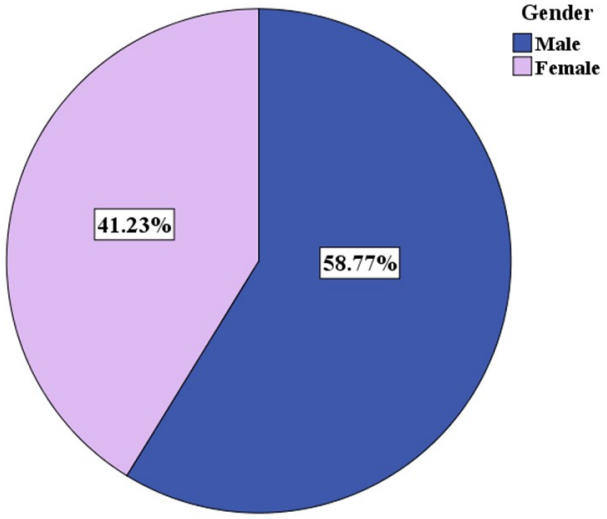

Figure 4.1. Gender distribution for questionnaire participants of both groups based on the age categories provided for the participants.

Table 4.1. Age category distribution of the questionnaire participants.

Groups and Age Categories		Frequency (n)	Total Count (n)	Percent (%)
Arab Residents	Below 18	1	201	0.5%
	19 to 25	20		10.0%
	26 to 35	105		52.2%
	36 to 45	60		29.9%
	46 to 60	15		7.5%
	60 and above	0		0.0%
Turkish Residents	Below 18	3	204	1.5%
	19 to 25	56		27.5%
	26 to 35	73		35.8%
	36 to 45	35		17.2%
	46 to 60	30		14.7%
	60 and above	7		3.4%

Table 4.1 shows the distribution of the participants based on their respective groups. From this table, 82.1% of the Arab residents in Ankara are between the ages of 26 and

45, however, the Turkish participants have more natural distribution among the different categories.

Furthermore, the participants indicated their education level as part of the demographics section of the questionnaire as shown in Table 4.2 distributed on four categories; students, housewives, working persons and retired persons. From the results of the questions, the majority of the Arab residents participating in the study are students, while the majority of Turkish residents participating in the study are working persons, which confirms to the demographic nature of the two categories in the city.

Table 4.2. Occupation of the questionnaire participants.

Groups and Occupations		Frequency (n)	Total Count (n)	Percent (%)
Arab Residents	Students	123	201	61.2%
	Housewives	23		11.4%
	Working Persons	53		26.4%
	Retired Persons	2		1.0%
Turkish Residents	Students	59	204	28.9%
	Housewives	13		6.4%
	Working Persons	110		53.9%
	Retired Persons	22		10.8%

Furthermore, the participants indicated their education level as shown in Table 4.3. The majority of the participants are holding or pursuing Master's or Bachelor's degrees for Arab and Turkish groups, respectively.

Table 4.3. Education Level of the questionnaire participants.

Groups and Education Level		Frequency (n)	Total Count (n)	Percent (%)
Arab Residents	Primary School	1	201	0.5%
	Middle School	4		2.0%
	High School	23		11.4%
	University Degree	53		26.4%
	Master's Degree	113		56.2%
	Doctoral Degree	7		3.5%
Turkish Residents	Primary School	8	204	3.9%
	Middle School	27		13.2%
	High School	51		25.0%
	University Degree	92		45.1%
	Master's Degree	24		11.8%
	Doctoral Degree	2		1.0%

Figure 4.2 show the nationality distribution of the questionnaire participants. While the number of Turkish residents conform to the control group count, the experimental group counts consisting of Arab residents are distributed among eight countries; Libya, Syria, Iraq, Egypt, Jordan, Palestine, Saudi Arabia (KSA) and Algeria. The majority of the Arab participants, 80.1%, are from Libya and Iraq.

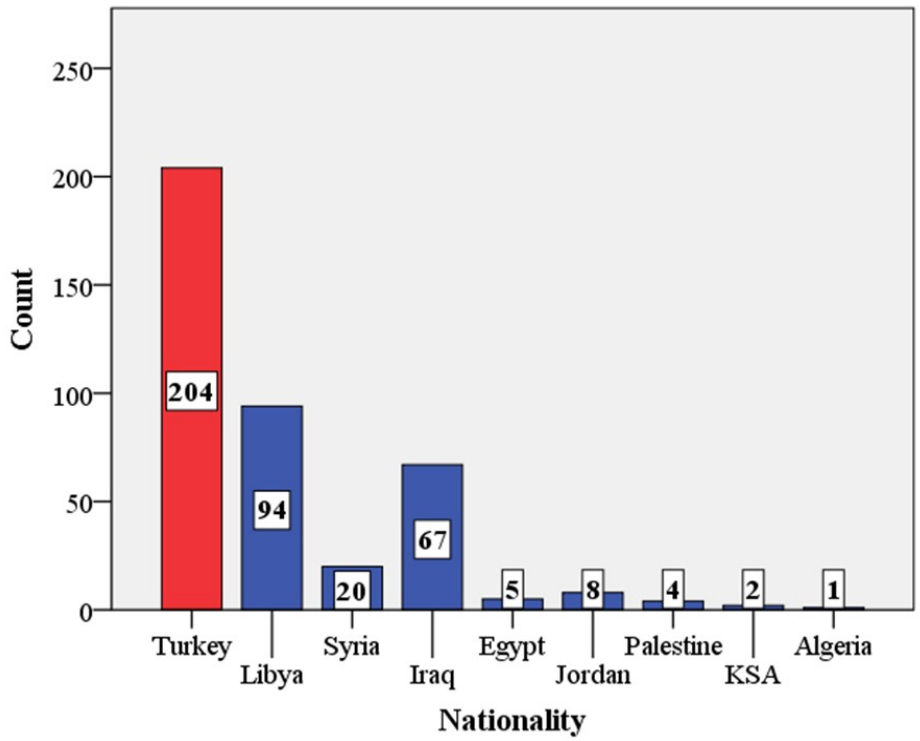

Figure 4.2. Nationality of questionnaire participants.

4.1.2. Questions on Residential Environment

This section of the questionnaire required the questionnaire participants of each group to indicate their house type, area and the time that they most spend in it. Table 4.4 shows the periods that participants have lived in their current houses. The majority of the Arab group, 77.1%, have lived in their current houses for a period ranging between 1 to 5 years. Nonetheless, while the Turkish group's majority lays within the same category 34.8%, higher periods seem to have close percentages of 29.9% and 23.0% for the periods 5 to 10 years and more than 10 years, respectively.

Table 4.4. Residency time in current house setting for the Turkish and Arab questionnaire participants.

Groups and Living Periods		Frequency (n)	Total Count (n)	Percent (%)
Arab Residents	Less than a year	37	201	18.4%
	1 to 5 years	155		77.1%
	5 to 10 years	6		3.0%
	More than 10 years	3		1.5%
Turkish Residents	Less than a year	25	204	12.3%
	1 to 5 years	71		34.8%
	5 to 10 years	61		29.9%
	More than 10 years	47		23.0%

Moreover, the participants indicated the type of their house between having a detached house, attached house, terraced house and an apartment as shown in Table 4.5. It shows through both groups that an apartment is the most common dwelling in the city with 91.0% and 94.6% for the Arab and Turkish groups, respectively.

Table 4.5. House types of the questionnaire participants

Groups and House types		Frequency (n)	Total Count (n)	Percent (%)
Arab Residents	Detached house (villa)	14	201	7.0%
	Attached house	3		1.5%
	Terraced house	1		0.5%
	Apartment	183		91.0%
Turkish Residents	Detached house (villa)	4	204	2.0%
	Attached house	1		0.5%
	Terraced house	6		2.9%
	Apartment	193		94.6%

The participants who have indicated that they live in an apartment were further asked to indicate the location of their apartment within their building from being at the basement, ground floor, intermediate floor or top floor. Table 4.6 shows that the majority of both groups reside in intermediate floor. However, 38.3% of the Arab group has a house located in the basement floor.

Table 4.6. Location of apartment within the buildings of the questionnaire participants.

Groups and Apartment Location		Frequency (n)	Total Count (n)	Percent (%)
Arab Residents	Basement	70	183	38.3%
	Ground Floor	2		1.1%
	Intermediate Floor	98		53.6%
	Top Floor	13		7.1%
Turkish Residents	Basement	25	193	13.0%
	Ground Floor	26		13.5%
	Intermediate Floor	110		57.0%
	Top Floor	32		16.6%

The participants who selected an intermediate floor in the previous question have been also asked to indicate their floor number within the building as shown in Table 4.7. The results show that 89.8% of the Arab group and 72.6% of the Turkish group, who live in intermediate floors, have their houses located within the first three floors of the apartment buildings. Therefore, according to the results of the previous questions, 79.6% (N=160) of the Arab residents in Ankara and 64.2% (N=131) of the Turkish residents in Ankara are within the first few floors within their buildings.

Table 4.7. Floor number of intermediate floor within the buildings of the questionnaire participants.

Groups and Intermediate Floors		Frequency (n)	Total Count (n)	Percent (%)
Arab Residents	1st Floor	44	98	**44.9%**
	2nd Floor	32		**32.7%**
	3rd Floor	12		**12.2%**
	4th Floor	5		5.1%
	5th Floor	2		2.0%
	6th Floor	1		1.0%
	7th Floor	1		1.0%
	8th Floor	0		0.0%
	9th Floor	0		0.0%
	10th Floor	1		1.0%
Turkish Residents	1st Floor	15	110	**13.6%**
	2nd Floor	27		**24.5%**
	3rd Floor	38		**34.5%**
	4th Floor	9		8.2%
	5th Floor	5		4.5%
	6th Floor	6		5.5%
	7th Floor	7		6.4%
	8th Floor	2		1.8%
	9th Floor	0		0.0%
	10th Floor	1		0.9%

Furthermore, the questionnaire participants were asked to mention their area of residence within Ankara out of the twelve municipalities that forms the big city. As shown in Table 4.8, the majority of Arab residents in the city live in Çankaya, 66.2%. While this also applies to the Turkish residents, the numbers of the Turkish groups are more distributed among all areas of the city.

Table 4.8. Ankara Residential Areas for the questionnaire participants.

Groups and Ankara Areas		Frequency (n)	Total Count (n)	Percent (%)
Arab Residents	Altındağ	3	201	1.5%
	Gölbaşı	3		1.5%
	Beypazarı	0		0.0%
	Çankaya	**133**		**66.2%**
	Etimesgüt	16		8.0%
	Kahramankazan	0		0.0%
	Keçiören	20		10.0%
	Mamak	15		7.5%
	Nallıhan	0		0.0%
	Polatlı	0		0.0%
	Sincan	2		1.0%
	Yenimahalle	9		4.5%
Turkish Residents	Altındağ	14	204	6.9%
	Gölbaşı	11		5.4%
	Beypazarı	2		1.0%
	Çankaya	**77**		**37.7%**
	Etimesgüt	21		10.3%
	Kahramankazan	5		2.5%
	Keçiören	19		9.3%
	Mamak	20		9.8%
	Nallıhan	1		0.5%
	Polatlı	2		1.0%
	Sincan	9		4.4%
	Yenimahalle	23		11.3%

Moreover, the participants of both groups were asked to indicate the time periods where they spend the least and most in their houses. Table 4.9 shows the means and standard deviations for each of the four time periods used in the study and for the two study groups. The means indicate that the Morning period is the least period where people of

both groups spend their times at their houses, while the midnight period has the highest mean scores with lowest standard deviation indicating that people of both groups spend most of their time during midnight in their houses especially for sleeping purpose.

Table 4.9. Means of the periods according to participants' usage of their houses.

Groups and Daily Usage Periods		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
	Std. Deviation	1.035	0.797	0.822	0.850
Turkish Residents (N=204)	Mean	1.69	1.70	2.79	3.82
	Std. Deviation	0.824	0.669	0.651	0.569

4.1.3. Questions on Soundscape Evaluation

In the first part of this evaluation, the participants specified the importance of the sound environments in their houses. The mean for both groups is calculated as 3.33 (Very important having the score of 4), which indicates the importance of the sound environment for the questionnaire participants. Figure 4.3 shows a comparison between the Arab and Turkish groups, having means of 3.30 and 3.35, respectively. The means and the bar chart show slight difference in favourability of sound sources of the Turkish participants on the importance of the sound environment of their houses in Ankara.

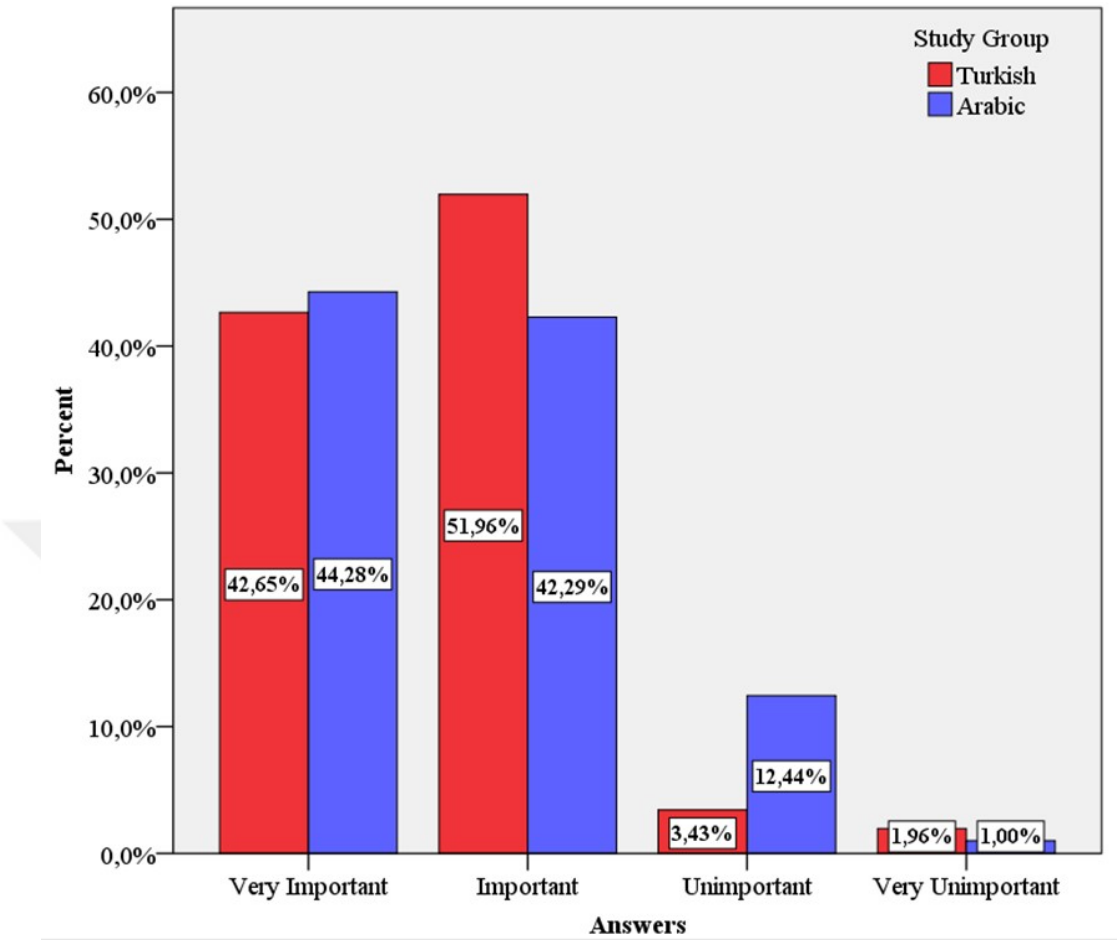

Figure 4.3. Importance of sound environment in participants' houses.

Furthermore, the participants stated their overall satisfaction level of the sound environment in their houses in Ankara, which resulted into means of 3.04 and 2.75 for Arab and Turkish groups, respectively. As shown by the statistics and the comparison presented in Figure 4.4, the Arab group demonstrate a higher satisfaction level than Turkish group. The mean for all participants is 2.89, indicating a moderate level of satisfaction from the overall sound environments of their Ankara houses.

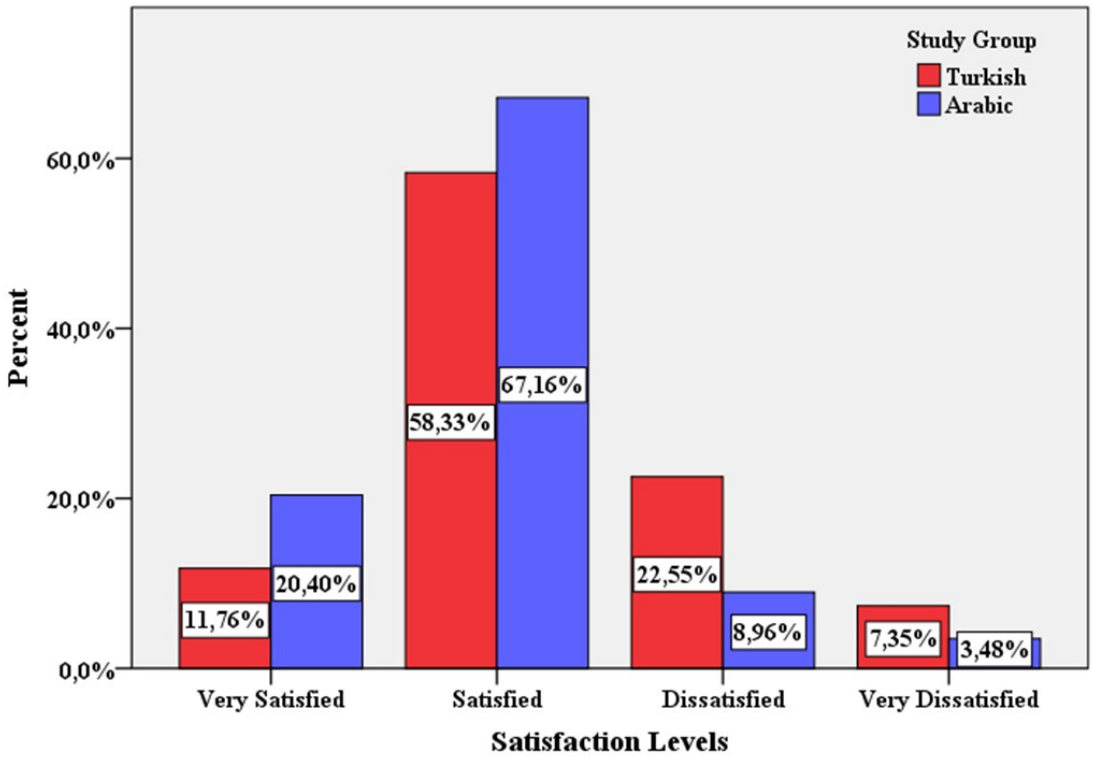

Figure 4.4. Satisfaction of overall sound environment in participants' houses.

Tables 4.10 and 4.11 illustrate the adjectives assigned to their houses' acoustic environment by the Arab and Turkish residents, respectively. The Arab participants majorly assigned positive adjectives to the acoustic environment of Ankara, while their assignment tended to be moderate rather than choosing the highest positive rank. Furthermore, the Turkish participants followed the same trend in assigning the adjectives to their houses' acoustic environment. However, the comparison between both statistical tests shows less satisfaction level from the Turkish participants. These results show moderate satisfaction of the acoustic environment of Ankara through adjective assignment.

Table 4.10. Evaluation of the acoustic environment through given adjective pairs by Arab participants.

Adjectives and Scales		Count (n)	Percent (%)
Quietness	Very Quiet	45	22.4%
	Quiet	130	64.7%
	Noisy	25	12.4%
	Very Noisy	1	0.5%
Goodness	Very Good	50	24.9%
	Good	124	61.7%
	Bad	26	12.9%
	Very Bad	1	0.5%
Pleasantness	Very Pleasant	35	17.4%
	Pleasant	134	66.7%
	Unpleasant	29	14.4%
	Very Unpleasant	3	1.5%
Peacefulness	Very Peaceful	43	21.4%
	Peaceful	133	66.2%
	Stressing	24	11.9%
	Very Stressing	1	0.5%
Comfort	Very Comfortable	38	18.9%
	Comfortable	137	68.2%
	Uncomfortable	24	11.9%
	Very Uncomfortable	2	1.0%
Positivity	Very Positive	38	18.9%
	Positive	138	68.7%
	Negative	25	12.4%
	Very Negative	0	0.0%
Favourability	Very Favourable	36	17.9%
	Favourable	140	69.7%
	Unfavourable	23	11.4%
	Very Unfavourable	2	1.0%
Calmness	Very Calm	23	11.4%
	Calm	143	71.1%
	Agitating	33	16.4%
	Very Agitating	2	1.0%

Table 4.11. Evaluation of the acoustic environment through given adjective pairs by Turkish participants.

Adjectives and Scales		Count (n)	Percent (%)
Quietness	Very Quiet	20	9.8%
	Quiet	115	56.4%
	Noisy	57	27.9%
	Very Noisy	12	5.9%
Goodness	Very Good	23	11.3%
	Good	130	63.7%
	Bad	41	20.1%
	Very Bad	10	4.9%
Pleasantness	Very Pleasant	28	13.7%
	Pleasant	121	59.3%
	Unpleasant	43	21.1%
	Very Unpleasant	12	5.9%
Peacefulness	Very Peaceful	30	14.7%
	Peaceful	124	60.8%
	Stressing	38	18.6%
	Very Stressing	12	5.9%
Comfort	Very Comfortable	37	18.1%
	Comfortable	119	58.3%
	Uncomfortable	36	17.6%
	Very Uncomfortable	12	5.9%
Positivity	Very Positive	29	14.2%
	Positive	124	60.8%
	Negative	43	21.1%
	Very Negative	8	3.9%
Favourability	Very Favourable	29	14.2%
	Favourable	129	63.2%
	Unfavourable	36	17.6%
	Very Unfavourable	10	4.9%
Calmness	Very Calm	25	12.3%
	Calm	114	55.9%
	Agitating	52	25.5%
	Very Agitating	13	6.4%

4.1.4. Questions on Sound Source Perception

The participants were asked to evaluate the sound levels of 22 sounds chosen from the acoustic environment of the city and from the literature on an even scale. The overall means show that religious sounds (2.23), passing by vehicles (1.95), police/ambulance sirens (1.93), and horns of vehicles (1.91) are the sound sources that are perceived as the loudest in the houses. Table 4.12 shows the overall means for the sound levels of each sound source and the comparison between the two study groups, where significant differences are highlighted. The comparison shows that the Turkish residents perceive traffic, nearby construction, neighbours shouting and natural sounds higher than the Arab residents, while the Arab residents' perception of the sound level of the domestic equipment is higher than the Turkish residents of Ankara.

Table 4.12. Overall means and means comparison of loudness perception in the houses of both study groups.

Sound sources Answer Scale: 0-I do not hear it, 1-Very low sound level, 2-Low sound level, 3- High sound level, 4- Very high sound level.	Overall Means	Arab Group Means	Turkish Group Means
Planes, jets, and helicopters that are passing by	1.28	0.92	**1.64**
Trains or subway trains that are passing by	0.30	0.25	0.36
Motorcycles, cars, buses, and trucks that are passing by	**1.95**	1.92	1.98
Horns from vehicle	**1.91**	1.72	**2.10**
Police/ambulance sirens	**1.93**	1.82	**2.03**
Nearby schools (children shouting, bells, etc.)	1.34	1.15	1.53
Religious sounds (azan, church bell, etc.)	**2.23**	2.19	2.27
Shutters of shops / markets	0.63	0.52	0.74
Nearby Construction	1.01	0.78	**1.24**
People on the street (talking, walking, etc.)	1.11	1.02	1.20
Domestic equipment in the house	1.74	**1.89**	1.58
Talking, shouting in the house	1.84	1.93	1.75
Movement in the house (walking, furniture, doors)	1.65	1.76	1.55
Neighbours talking, shouting	1.59	1.37	**1.81**
Neighbours' domestic equipment	1.31	1.20	1.41

Table 4.12. Overall means and means comparison of loudness perception in the houses of both study groups.

Sound sources Answer Scale: 0-I do not hear it, 1-Very low sound level, 2-Low sound level, 3- High sound level, 4- Very high sound level.	Overall Means	Arab Group Means	Turkish Group Means
Neighbours' movement (walking, furniture, doors)	1.47	1.44	1.50
Drainage systems/ water pipes	1.39	1.44	1.35
Rain	1.28	0.96	**1.59**
Wind	1.13	0.73	**1.53**
Domesticated animals (cats, dogs, birds, etc.)	0.83	0.53	**1.13**
Street animals (dogs, cats)	1.09	0.84	**1.33**
Urban birds	1.15	0.86	**1.44**

In evaluation of the frequency of the sounds, the questionnaire participants evaluated the same previously compiled sounds. The overall means show that religious sounds (2.34), passing by vehicles (1.88), and police/ambulance sirens (1.88) are the most frequent sounds in the houses of Ankara. Table 4.13 shows the overall means for the sound frequencies of each sound source and the comparison between the two study groups, where significant differences are highlighted. The comparison shows that the Turkish residents perceive planes, jets and helicopters passing by, traffic, nearby construction, neighbours shouting and natural sounds as more frequent than the Arab residents, while the Arab residents' perception of the religious, domestic equipment, and drainage system sounds as more frequent than the Turkish residents of Ankara.

Table 4.13. Overall means and means comparison of sound source frequency of occurrence perception in the houses of both study groups.

Sound sources Answers Scale: 0-Sound does not occur, 1-Very infrequent, 2-Infrequent, 3- Frequent, 4- Very frequent.	Overall Means	Arab Group Means	Turkish Group Means
Planes, jets, and helicopters that are passing by	1.16	0.88	**1.45**
Trains or subway trains that are passing by	0.33	0.24	0.41
Motorcycles, cars, buses, and trucks that are passing by	**1.88**	1.89	1.87

Table 4.13. Overall means and means comparison of sound source frequency of occurrence perception in the houses of both study groups.

Sound sources Answers Scale: 0-Sound does not occur, 1-Very infrequent, 2-Infrequent, 3- Frequent, 4- Very frequent.	Overall Means	Arab Group Means	Turkish Group Means
Horns from vehicle	**1.88**	1.79	1.97
Police/ambulance sirens	1.76	1.64	1.88
Nearby schools (children shouting, bells, etc.)	1.35	1.25	1.45
Religious sounds (azan, church bell, etc.)	**2.34**	**2.45**	2.24
Shutters of shops / markets	0.60	0.56	0.65
Nearby Construction	0.99	0.83	1.15
People on the street (talking, walking, etc.)	1.29	1.33	1.25
Domestic equipment in the house	1.70	**1.83**	1.56
Talking, shouting in the house	1.75	1.72	1.77
Movement in the house (walking, furniture, doors)	1.66	1.69	1.63
Neighbours talking, shouting	1.69	1.55	**1.82**
Neighbours' domestic equipment	1.44	1.39	1.48
Neighbours' movement (walking, furniture, doors)	1.54	1.49	1.58
Drainage systems/ water pipes	1.49	**1.61**	1.38
Rain	1.23	0.99	**1.47**
Wind	1.13	0.88	**1.45**
Domesticated animals (cats, dogs, birds, etc.)	0.89	0.70	**1.08**
Street animals (dogs, cats)	1.17	0.95	**1.40**
Urban birds	1.27	1.13	**1.41**

Finally, the questionnaire participants of both groups were asked to indicate the favourability of the same group of sounds on an even scale. The overall means (lower means indicate favourability) show that religious sounds (1.87), rain (2.14), and urban birds (2.17) are the most favourable sounds in the houses of Ankara. Table 4.14 shows the overall means for the sound favourability of each sound source and the comparison

between the two study groups, where significant differences are highlighted. The comparison shows that the Arab residents have less preference for trains/ subway, shops shutters, drainage systems, and animals' sounds than the Turkish residents, while the Turkish residents of Ankara have less preference for religious, rain and urban birds' sounds than the Arab residents of the city.

Table 4.14. Overall means and means comparison of sound source favourability perception in the houses of both study groups.

Sound sources Answers Scale: 1-Very favourable, 2-favourable, 3- Unfavourable, 4- Very unfavourable.	Overall Means	Arab Group Means	Turkish Group Means
Planes, jets, and helicopters that are passing by	2.97	3.15	2.79
Trains or subway trains that are passing by	2.99	3.39	**2.59**
Motorcycles, cars, buses, and trucks that are passing by	3.11	3.29	2.94
Horns from vehicle	3.16	3.28	3.03
Police/ambulance sirens	3.04	3.20	2.87
Nearby schools (children shouting, bells, etc.)	2.76	2.86	2.66
Religious sounds (azan, church bell, etc.)	**1.87**	**1.37**	2.37
Shutters of shops / markets	2.95	3.24	**2.66**
Nearby Construction	3.07	3.22	2.92
People on the street (talking, walking, etc.)	2.72	2.79	2.65
Domestic equipment in the house	2.83	2.96	2.71
Talking, shouting in the house	2.84	2.91	2.78
Movement in the house (walking, furniture, doors)	2.95	3.09	2.81
Neighbours talking, shouting	3.18	3.25	3.10
Neighbours' domestic equipment	3.14	3.27	3.00
Neighbours' movement (walking, furniture, doors)	3.13	3.30	2.96
Drainage systems/ water pipes	3.16	3.39	**2.93**
Rain	**2.14**	**1.83**	2.44
Wind	2.66	2.79	2.54

Table 4.14. Overall means and means comparison of sound source favourability perception in the houses of both study groups.

Sound sources Answers Scale: 1-Very favourable, 2-favourable, 3- Unfavourable, 4- Very unfavourable.	Overall Means	Arab Group Means	Turkish Group Means
Domesticated animals (cats, dogs, birds, etc.)	2.89	3.25	**2.53**
Street animals (dogs, cats)	2.96	3.30	**2.62**
Urban birds	**2.17**	**1.99**	2.36

In comparison between the two study groups in terms of their perception of sound loudness, sound frequency of occurrence and sound favourability, it can be concluded that different study groups have similarities and difference in their perception to the sound environment of Ankara. Moreover, in order to correlate the findings of the study to the cultural background of the participants, further statistical analysis is performed in the next Chapter.

5.STATISTICAL ANALYSIS AND DISCUSSION

This chapter of the case study provides statistical analysis for the results of the questionnaire and correlates the soundscape perception of the participants and their cultural backgrounds based on the following factors:

1. Importance of the house acoustic environment and correlations between Arab and Turkish residents.
2. Satisfaction of the house acoustic environment and correlations between Arab and Turkish residents.
3. Overall evaluation of residential soundscape through adjective pairs and correlations.
4. Sound source loudness evaluation and correlations between Arab and Turkish residents.
5. Sound source frequency of occurrence evaluation and correlations between Arab and Turkish residents.
6. Sound source favourability evaluation and correlations between Arab and Turkish residents.
7. Correlations between the results of the study, and the demographical and sound environment changes.

5.1 Comparison between the Results of the Study Groups

The following sections compare the soundscape perception factors considered in the research depending the study groups, which are the Arabic and Turkish people living in Ankara. Therefore, Hypotheses 1 to 6 are discussed and the main correlations are established.

5.1.1. Correlations on Importance Factor

The mean scores of the importance of the acoustic environment of the houses are compared for both study groups. Table 5.1 shows the mean scores of the Turkish residents and Arab residents of Ankara on the importance of the acoustic environment of their houses. 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 study groups. However, both scores being higher than the neutral mean score of 2.0 shows that the residential sound environment is relatively important for both groups.

Table 5.1. Means comparison between Turkish and Arab residents of Ankara on the importance of the sound environment of their houses.

Groups	Mean*	N	Std. Deviation
Turkish Residents	3.35	204	0.646
Arab Residents	3.30	201	0.721

* Score 4.0 represents the most important score; hence higher mean reflects higher score.

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 ANOVA test is conducted, which yielded a level of significance of 0.424 indicating no difference between both study groups as presented in Table 5.2. The results are also confirmed through an independent samples t-test, which showed a significant of less than 0.05 for the Levene's test for equality of variances (Appendix B).

Table 5.2. One-way ANOVA testing for the importance of sound environment to the study groups ($p < 0.05$).

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	0.300	1	0.300	0.641	0.424
Within Groups	188.678	403	0.468		
Total	188.978	404			

5.1.2. Correlations on Satisfaction Factor

A similar analysis is performed as shown in Table 5.3 below comparing the means of the two groups based on the satisfaction from the sound environment of their houses in Ankara. The Turkish residents' mean score (2.75) shows a moderate satisfaction from the sound environment of their houses in Ankara, being higher than the mid-range score of 2.0, while the Arab residents' mean score (3.04) shows a higher satisfaction level in comparison to the Turkish residents.

Table 5.3. Means comparison between Turkish and Arab residents of Ankara on the satisfaction from the sound environment of their houses

Groups	Mean*	N	Std. Deviation
Turkish Residents	2.75	204	0.758
Arab Residents	3.04	201	0.658

* Score 4.0 represents the most satisfied score; hence higher mean reflects higher score.

To confirm the correlation between the satisfaction from the sound environment of the residential context of Ankara and the cultural background of the participants, a one-way ANOVA test is conducted, which yielded a level of significance of 0.000 indicating a strong relation between the two parameters, as shown in Table 5.4. The results are also confirmed through an independent samples t-test, which showed a significant of less than 0.05 for the Levene's test for equality of variances (Appendix B).

Table 5.4. One-way ANOVA testing for the satisfaction of sound environment to the study groups ($p < 0.05$).

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	9.092	1	9.092	18.020	**0.000**
Within Groups	203.342	403	0.505		
Total	212.435	404			

5.1.3. Overall Soundscape Evaluations

In regards to the adjectives assignment by the Turkish and Arab residents of Ankara, Table 5.5 compares the mean score of both groups for each adjective. The analysis results show a higher mean for adjective assignment for the Arab residents in comparison to the Turkish residents, which reflects a more positive evaluation from the Arab residents in all eight categories.

Table 5.5. Adjectives assignment means comparison.

Adjectives	Turkish Residents (N=204)		Arab Residents (N=201)	
	Mean*	Std. Deviation	Mean*	Std. Deviation
Quietness	2.70	0.725	3.09	0.602
Goodness	2.81	0.691	3.11	0.623
Pleasantness	2.81	0.741	3.00	0.616
Peacefulness	2.84	0.739	3.08	0.590
Comfort	2.89	0.764	3.05	0.590
Positivity	2.85	0.700	3.06	0.557
Favourability	2.87	0.707	3.04	0.577
Calmness	2.74	0.753	2.93	0.561

* Score 4.0 represents the most positive adjective, while score 1 represents the most negative adjective.

A one-way ANOVA testing 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 5.6. The results are also confirmed through an independent samples t-test, which showed a significant of less than 0.05 for the Levene's test for equality of variances, except for the goodness adjective, where it was calculated as 0.171 (Appendix B)..

Table 5.6. One-way ANOVA testing for the overall soundscape evaluation to the study groups ($p < 0.05$).

		Sum of Squares	df	Mean Square	F	Sig.
Quietness	Between Groups	15.287	1	15.287	34.388	0.000
	Within Groups	179.148	403	0.445		
	Total	194.435	404			
Goodness	Between Groups	8.854	1	8.854	20.447	0.000
	Within Groups	174.514	403	0.433		
	Total	183.368	404			
Pleasantness	Between Groups	3.700	1	3.700	7.951	0.005
	Within Groups	187.544	403	0.465		
	Total	191.244	404			
Peacefulness	Between Groups	5.902	1	5.902	13.174	0.000
	Within Groups	180.543	403	0.448		
	Total	186.444	404			
Comfort	Between Groups	2.673	1	2.673	5.733	0.017
	Within Groups	187.909	403	0.466		
	Total	190.583	404			
Positivity	Between Groups	4.539	1	4.539	11.309	0.001
	Within Groups	161.747	403	0.401		
	Total	166.286	404			
Favourability	Between Groups	3.177	1	3.177	7.619	0.006
	Within Groups	168.023	403	0.417		
	Total	171.200	404			
Calmness	Between Groups	3.661	1	3.661	8.276	0.004
	Within Groups	178.255	403	0.442		
	Total	181.916	404			

5.1.4. Sound Source Loudness Evaluations

In evaluation of the correlation between the perception of sound loudness and the cultural backgrounds of the study groups, Table 5.7 shows a one-way ANOVA testing of the perception of the loudness of twenty-two sound sources for the Arab and Turkish residents. The results indicate that cultural differences influence the loudness perception of several sound sources, as highlighted in the table, while there is no significant correlation between other sound sources and the cultural factor. The results are also

confirmed through an independent samples t-test, which showed a significant of less than 0.05 for the Levene's test for equality of variances (Appendix B).

Table 5.7. One-way ANOVA testing and study groups' means for the sound source loudness evaluation to the study groups ($p < 0.05$).

	Arab Means	Turkish Means	Sum of Squares	F	Sig.
Planes, jets, and helicopters	0.92	**1.64**	52.753	42.972	**0.000**
Trains or subway trains	.025	0.36	1.205	1.782	0.183
Motorcycles, cars, buses, and trucks	1.92	1.98	0.365	0.278	0.599
Horns from vehicle	1.72	**2.10**	15.126	11.730	**0.001**
Police/ambulance sirens	1.82	2.03	4.402	3.041	0.082
Nearby schools	1.15	**1.53**	14.251	8.146	**0.005**
Religious sounds	2.19	2.27	0.739	0.651	0.420
Shutters of shops / markets	0.52	**0.74**	4.806	4.844	**0.028**
Nearby Construction	0.78	**1.24**	21.805	17.640	**0.000**
People on the street	1.02	1.20	3.140	2.973	0.085
Domestic equipment in your house	**1.89**	1.58	9.555	10.103	**0.002**
Talking, shouting in your house	1.93	1.75	3.114	2.751	0.098
Movement in your house	**1.76**	1.55	4.347	3.985	**0.047**
Neighbours talking, shouting	1.37	**1.81**	19.219	14.543	**0.000**
Neighbours' domestic equipment	1.20	1.41	4.167	3.281	0.071
Neighbours' movement	1.44	1.50	0.456	0.366	0.546
Drainage systems/ water pipes	1.44	1.35	0.816	0.643	0.423
Rain	0.96	**1.59**	40.560	38.109	**0.000**
Wind	0.73	**1.53**	64.484	57.200	**0.000**
Domesticated animals	0.53	**1.13**	37.057	30.137	**0.000**
Street animals (dogs, cats)	0.84	**1.33**	24.561	19.399	**0.000**
Urban birds	0.86	**1.44**	34.702	28.246	**0.000**

By studying the means of both study groups and the significance difference between the means using one-way ANOVA and Independent Sample t-test, Table 5.8 summarizes the sound sources' loudness that are perceived differently by both study groups. The results show that the Arab group perceives the sounds inside their houses louder than the Turkish groups, while the Turkish group perceives all natural sound sources, in addition to sounds of planes, horns from vehicles, school bell, market shutters, nearby construction sound, and neighbours talking/ shouting, louder than the Arab group. This could be attributed to the Arab residences' background where such sounds are considered normally high, and the difference in environment, where the Turkish residents appreciate natural sounds better.

Table 5.8. Sounds loudness that are perceived significantly different between study groups.

Sounds that are significantly perceived louder by the Turkish group than the Arab group	Sounds that are significantly perceived louder by the Arab group than the Turkish group
Planes, jets, and helicopters	Domestic equipment in your house
Horns from vehicle	Movement in your house
Nearby schools	
Shutters of shops / markets	
Nearby Construction	
Neighbours talking, shouting	
Rain	
Wind	
Domesticated animals	
Street animals (dogs, cats)	
Urban birds	

5.1.5. Sound Source Frequency of Occurrence Evaluations

Furthermore, the correlation between the perception of sound frequency of occurrence and the cultural backgrounds of the study groups, is conducted through a one-way ANOVA testing of the perception of the frequency of occurrence of twenty-two sound sources for the Arab and Turkish people, as shown in Table 5.9. The results indicate that cultural differences influence the frequency of occurrence perception of several sound sources, as highlighted in the table, while there is no significant correlation between

other sound sources and the cultural factor. The results are also confirmed through an independent samples t-test, which showed a significant of less than 0.05 for the Levene's test for equality of variances (Appendix B).

Table 5.9. One-way ANOVA testing and study groups' means for the sound frequency of occurrence evaluation to the study groups ($p < 0.05$).

	Arab Means	Turkish Means	Sum of Squares	F	Sig.
Planes, jets, and helicopters	0.88	**1.45**	32.947	27.530	**0.000**
Trains or subway trains	0.24	**0.41**	3.029	4.423	**0.036**
Motorcycles, cars, buses, and trucks	1.89	1.87	0.017	0.012	0.914
Horns from vehicle	1.79	1.97	3.266	2.391	0.123
Police/ambulance sirens	1.64	1.88	5.623	3.714	0.055
Nearby schools	1.25	1.45	3.942	2.250	0.134
Religious sounds	2.45	2.24	4.570	3.088	0.080
Shutters of shops / markets	0.56	0.65	0.729	0.803	0.371
Nearby Construction	0.83	**1.15**	10.124	8.295	**0.004**
People on the street	1.33	1.25	0.703	0.557	0.456
Domestic equipment in your house	**1.83**	1.56	7.224	5.936	**0.015**
Talking, shouting in your house	1.72	1.77	0.286	0.211	0.646
Movement in your house	1.69	1.63	0.354	0.292	0.589
Neighbours talking, shouting	1.55	**1.82**	7.727	5.709	**0.017**
Neighbours' domestic equipment	1.39	1.48	0.773	0.591	0.442
Neighbours' movement	1.49	1.58	0.747	0.564	0.453
Drainage systems/ water pipes	1.61	1.38	5.108	3.330	0.069
Rain	0.99	**1.47**	23.866	21.384	**0.000**
Wind	0.80	**1.45**	42.774	38.260	**0.000**
Domesticated animals	0.70	**1.08**	14.767	10.996	**0.001**
Street animals (dogs, cats)	0.95	**1.40**	20.665	14.279	**0.000**
Urban birds	1.13	**1.41**	7.793	5.483	**0.020**

By studying the means of both study groups and the significance difference between the means using one-way ANOVA and Independent Sample t-test, Table 5.10 summarizes the sound sources' frequencies that are perceived differently by both study groups. The results show that the Arab residents perceive the equipment sounds in their houses as more frequent than the Turkish residents, while the Turkish group perceive all natural sound sources, in addition to planes, trains/ subway trains, nearby construction and neighbours talking/ shouting, nore frequent than the Arab group. This could be attributed to the Arab residents' background where such sounds are perceived normally more frequent, which could be related to cultural habits of using these equipment more, and the difference in environment, where the Turkish residents recognize the natural sounds more frequently.

Table 5.10. Sounds frequencies that are perceived significantly different between study groups.

Sounds that are significantly perceived more frequent by the Turkish group than the Arab group	Sounds that are significantly perceived more frequent by the Arab group than the Turkish group
Planes, jets, and helicopters	Domestic equipment in your house
Trains or subway trains	
Nearby Construction	
Neighbours talking, shouting	
Rain	
Wind	
Domesticated animals	
Street animals (dogs, cats)	
Urban birds	

5.1.6. Sound Source Favourability Evaluations

Similarly, a one-way ANOVA testing is performed to correlate the favourability of the sound sources and the cultural background of the study groups. As shown in Table 5.11, the results indicate that cultural differences influence the majority of the sound favourability of several sound sources, as highlighted in the table, while there are two sound sources that showed weak correlation, which are the sounds of the people in the street and the talking/ shouting in the participant's house. The results are also confirmed

through an independent samples t-test, which showed a significant of less than 0.05 for the Levene's test for equality of variances (Appendix B).

Table 5.11. One-way ANOVA testing and study groups' means for the sound favourability evaluation to the study groups ($p < 0.05$).

	Arab Means	Turkish Means	Sum of Squares	F	Sig.
Planes, jets, and helicopters	3.15	**2.79**	13.489	18.481	**0.000**
Trains or subway trains	3.39	**2.59**	64.768	91.538	**0.000**
Motorcycles, cars, buses, and trucks	3.29	**2.94**	12.922	20.354	**0.000**
Horns from vehicle	3.28	**3.03**	6.042	9.932	**0.002**
Police/ambulance sirens	3.20	**2.87**	11.121	17.417	**0.000**
Nearby schools	2.86	**2.66**	4.207	5.467	**0.020**
Religious sounds	**1.37**	2.37	102.135	130.073	**0.000**
Shutters of shops / markets	3.24	**2.66**	33.712	45.858	**0.000**
Nearby Construction	3.22	**2.92**	8.951	12.924	**0.000**
People on the street	2.79	2.65	2.099	3.206	0.074
Domestic equipment in your house	2.96	**2.71**	6.294	11.080	**0.001**
Talking, shouting in your house	2.91	2.78	1.609	2.550	0.111
Movement in your house	3.09	**2.81**	7.983	16.921	**0.000**
Neighbours talking, shouting	3.25	**3.10**	2.153	4.244	**0.040**
Neighbours' domestic equipment	3.27	**3.00**	7.581	15.751	**0.000**
Neighbours' movement	3.30	**2.96**	11.885	24.106	**0.000**
Drainage systems/ water pipes	3.39	**2.93**	22.039	38.642	**0.000**
Rain	**1.83**	2.44	38.331	46.924	**0.000**
Wind	2.79	**2.54**	6.421	9.114	**0.003**
Domesticated animals	3.25	**2.53**	52.400	74.143	**0.000**
Street animals (dogs, cats)	3.30	**2.62**	46.261	66.576	**0.000**
Urban birds	**1.99**	2.36	14.069	16.882	**0.000**

As seen from the previous results, the majority of the sound sources have shown significant difference to the $p < 0.05$ level between the means of the Arab and Turkish residents of Ankara. However, most of these differences are caused by a lower mean from the Turkish study group, except for religious sounds, rain and urban birds, where more favourability is demonstrated by the Arab study group. In this section, the lower

means reflect higher favourability of the sound sources. Therefore, these results could be due to the Turkish residents' being used to the sound environment of the city, versus the Arab residents who are new to the environment.

5.2. Analysis on Demographics and Residential Environment Factors

The following sections discuss the correlations between the demographics and the sound environment changes with the soundscape perception. Thus, hypotheses 7 to 18 are discussed through the suitable correlation and variance tests.

5.2.1. Correlations between Importance and Demographics

On testing the correlation between the importance of the sound environment and the four demographic information of the participants using Pearson's rho, which are gender, age category, education level and occupation, the results show that the importance of the sound environment is weakly correlated to all the demographical factors (Full results in Appendix C). Table 5.12 shows a summary of the correlations. However, gender has the most relative correlation with the importance of the sound environment, where the negative results indicate that males have a higher importance for the sound environment than females (Gender SPSS coding is 1 = male and 2 = female).

Table 5.12. Spearman's correlation between importance of sound environment and demographics

		1	2	3	4	5
1	Gender	1.000	-.184*	.077	-.167**	-.127*
2	Age Category		1.000	.342**	.032	.097
3	Occupation			1.000	-.414**	.042
4	Education Level				1.000	.074
5	Importance of Sound Environment					1.000

**. Correlation is significant at the 0.01 level (2-tailed)

*. Correlation is significant at the 0.05 level (2-tailed)

5.2.2 Correlations between Importance and Residential Environment

Using Spearman's rho, the importance of the sound environment is tested for correlation with the residential environment factors including the period that the participants have lived in their current residents, the house type, the floor number and the area where they live in Ankara. The results show that there is no correlation between the importance of the sound environment and the changes in the residential environment (Appendix D).

5.2.3. Correlations between Satisfaction and Demographics

The correlation between the overall satisfaction from the sound environment and the demographic factors included in this research, which are gender, age category, occupation and education level, shows that there is no correlation between the two factors (Appendix C), Table 5.13 shows a summary of the correlation results. However, the highest correlation factor has been with the occupation (Spearman's rho = -0.110 at a significance of 0.027 2-tailed), which is considered a very weak correlation indicating that a higher satisfaction is correlated with students and housewives.

Table 5.13. Spearman's correlation between satisfaction of sound environment and demographics

		1	2	3	4	5
1	Gender	1.000	-.184**	.077	-.167**	-.066
2	Age Category		1.000	.342**	.032	.046
3	Occupation			1.000	-.414**	-.110*
4	Education Level				1.000	.094
5	Satisfaction from Sound Environment					1.000

**. Correlation is significant at the 0.01 level (2-tailed)

*. Correlation is significant at the 0.05 level (2-tailed)

5.2.4. Correlations between Satisfaction and Residential Environment

By testing the correlation between the overall satisfaction from the sound environment and the changes in the residential environment factors, which include the period that the participants have lived in their current residents, the house type, the floor number and the area where they live in Ankara, the results show that there is no correlation between the two tested groups of parameters (Appendix D). Summary correlations are presented in Table 5.14. There is a very weak correlation between the overall satisfaction from the sound environment and the area where the participants are living within Ankara (Spearman's rho = -0.123 at a significance of 0.013 2-tailed). The negative sign of the correlation also indicates that the lower levels of satisfaction are emerging from the first half of the twelve municipal areas, which are Altındağ, Gölbaşı, Beypazarı, Çankaya, Etimesgüt and Kahramankazan, where Çankaya for example is one of the central areas in Ankara and the most dense municipal area of the city.

Table 5.14. Spearman's correlation between satisfaction of sound environment and residential environment

		1	2	3	4	5	6
1	Period of living in the current house	1.000	-.022	.050	-.010	.134**	-.082
2	House type		1.000	.364**	.250**	.015	-.032
3	Location of apartment within the building			1.000	.457**	.049	-.028
4	Number of intermediate floor				1.000	.132**	-.057
5	Living area in Ankara					1.000	-.123*
6	Satisfaction from Sound Environment						1.000

**. Correlation is significant at the 0.01 level (2-tailed)

*. Correlation is significant at the 0.05 level (2-tailed)

5.2.5. Correlations between Soundscape Evaluation and Demographics

In testing the correlation between the overall soundscape perception of the acoustic environment in Ankara and the demographic factors using Spearman's rho, the results show that there is no correlation between the two factors. In few instances a very weak correlation is noticed between some of the adjectives and the demographical factors with a coeffiecint ranging between -0.119 and 0.094 (Appendix C). Table 5.15 shows a summary of the correlation factors with the adjectives used in the overall soundscape evaluation. The significant correlations with the education level have a negative correlation with quietness, goodness, peacefulness, positivity and favourability perceptions, which indicate that residents with lower eaducation levels have a more positive evaluation for the perception of the soundscape in Ankara. Other significant correlations with positive signs are noticed between the age category and the goodness and calmness perceptions, which indicate that higher age categories have a more positive evaluation on the perception of the soundscape in Ankara.

Table 5.15. Spearman's correlation between overall soundscape evaluation and demographics

	Gender	Age Category	Occupation	Education Level
Quietness	.094	-.088	.063	-.119*
Goodness	.077	.118*	-.011	-.108*
Pleasantness	.035	-.052	.017	-.077
Peacefulness	.043	-.064	-.010	-.109*
Comfort	.045	-.046	-.010	-.055
Positivity	.052	-.086	-.009	-.099*
Favourability	.091	-.045	.039	-.109*
Calmness	.058	-.106*	-.004	-.065

**. Correlation is significant at the 0.01 level (2-tailed)

*. Correlation is significant at the 0.05 level (2-tailed)

5.2.6. Correlations between Soundscape Evaluation and Residential Environment

In testing the correlation between the overall soundscape perception of the acoustic environment of Ankara and the residentail environment factors using Spearman's rho, the results show that there is no correlation between the two factors. In few instances a very weak correlation is noticed between some of the adjectives and the residentail environment factors with a coeffiecints ranging between -0.068 and 0.111 (Appendix D). Moreover, Table 5.16 represents a summary of the correlations, where the only significant relationships are between the living area in Ankara and the goodness, comfort, positivity and favourability perceptions. Such results indicate with the positive sign of the correlation factors that the second half of the municipal areas in Ankara, including Keçiören, Mamak, Nallıhan, Polatlı, Sincan and Yenimahalle, have a more positive evaluation for the perception of the soundscape.

Table 5.16. Spearman's correlation between overall soundscape evaluation and residential environment

	Period of living in the current house	House type	Location of apartment within the building	Number of intermediate floor	Living area in Ankara
Quietness	.068	.055	.068	.080	0.063
Goodness	.006	.021	.019	.033	.099*
Pleasantness	-.023	.094	.064	.051	.034
Peacefulness	-.005	.073	-.004	.069	.069
Comfort	-.068	.036	.004	.069	.111*
Positivity	-.027	.046	.030	.086	.099*
Favourability	-.033	.093	.002	.070	.099*
Calmness	.008	.063	.028	.055	.064

**. Correlation is significant at the 0.01 level (2-tailed)

*. Correlation is significant at the 0.05 level (2-tailed)

5.2.7. Correlations between Sound Source Loudness and Demographics

When studying the correlation between the perception of the sound source loudness and the demographic factors using spearman's rho, the results show different factors that indicate no correlation to weak correlation between the sound sources and the four demographical factors (Appendix C and summary shown in Table 5.17). Nonetheless, the most significant results are noticed in the gender and the age categories.

Table 5.17. Spearman's correlation between sound source loudness and demographics

	Gender	Age Category	Occupation	Education Level
Planes, jets, etc.	.012	-.103*	-.005	-.071
Trains or subway trains	-.011	-.137**	-.006	-.029
Traffic vehicles	.069	-.149**	-.098*	.087
Horns from vehicles	.095	-.125*	.029	.010
Police/ambulance sirens	.075	-.028	-.059	.036
Nearby schools	.112*	-.172**	-.127*	-.088
Religious sounds	.063	-.103*	-.056	-.112*
Shutters of shops	.019	-.135**	-.054	-.091
Nearby Construction	.094	-.186**	-.055	-.090
People on the street	-.175**	-.199**	-.079	-.046
Equipment in house	.067	-.097	-.127*	.187**
Talking/ shouting in house	.165**	-.134**	-.136**	.057
Movement in house	.164**	-.131**	-.097	.091
Neighbours talking	.197**	-.199**	-.029	-.028
Neighbours' equipment	.114*	-.090	-.001	-.015
Neighbours' movement	.109*	-.113*	-.062	.076
Drainage systems/ pipes	.111*	-.058	-.072	.093
Rain	.060	-.072	.014	-.036
Wind	.030	-.105*	.040	-.046
Domesticated animals	.021	-.014	.104*	-.074
Street animals	.133**	-.152**	.051	-.089
Urban birds	.134**	-.162**	.020	-.053

**. Correlation is significant at the 0.01 level (2-tailed)

*. Correlation is significant at the 0.05 level (2-tailed)

In the gender correlation, the significant results are shown for people talking and walking on the street (0.175), talking/shouting in the house (0.165), movement in the house (0.164), and neighbours talking (0.194), which all have a positive sign indicating that females have a significantly louder perception of these sound sources.

Furthermore, in the correlations with the age category, the most significant results are shown for nearby schools (-0.172), nearby construction (-0.186), people talking/ walking in the street (-0.199), street animals (-1.52), and urban birds (-0.162). The negative sign for all the correlation factors indicate the lower age categories perceive the sound sources as higher. Other demographical factors, which included occupation and education levels had significant results with talking/shouting in participant's own house (-0.136) and equipment in the house (0.187), respectively. This indicates that students and housewives perceive talking and shouting in their houses louder, while people with higher education levels perceive the domestic equipment in their houses as louder.

5.2.8. Correlations between Sound Source Loudness and Residential Environment

Using Spearman's rho, a correlation test is performed between the perception of the sound sources loudness and the residential environment changes. All of the correlation factors presented in Appendix D show that there are no correlations to weak correlations between the two parameters. However, the most significant results are as the following:

1. Correlations with period since living in the house: Planes and jets (0.188), domesticated animals/pets (0.177), street animals (0.152) and urban birds (0.215), which indicates that the higher the period is lived in the house the louder these sound sources are perceived.
2. Correlations with house type: neighbours talking/shouting (0.163), which indicates that residents of apartments and attached houses (assigned to higher numbers on SPSS) perceive their neighbours talking/ shouting as louder.
3. Correlations with the location of the apartment within the building: Planes and jets passing by (0.196), indicating that higher apartments perceive this sound source as louder.

Moreover, no significant correlations were found regarding the location of the residential units within Ankara.

5.2.9. Correlations between Sound Source Frequency of Occurrence and Demographics

A correlation test using Spearman's rho is performed in order to assess the relationship between the frequency of occurrence of the sound sources and the demographic data of the participants, which its results show no correlations to weak correlations between the two parameters (Appendix C). The most significant results of the test are as the following:

1. Correlations with gender: nearby schools (0.183), talking/shouting in the house (0.265), and drainage systems/water pipes (0.155), where the positive signs of the correlation factors indicate that females have a higher frequency of occurrence perception regarding these sounds.
2. Correlations with age: nearby trains/subways (-0.151), nearby schools (-0.173), nearby construction (-0.177) and movement in the house (-0.168), where the negative sign of the correlation indicates that lower age categories perceive these sound sources as more frequent.
3. Correlations with occupation: people talking/shouting in the street (-0.167), domestic equipment (-0.165), and movement in the house (-0.174). As the SPSS value assignment for the occupation is 1= student, 2= housewife, 3= working person, and 4= retired, the negative sign of the correlations indicate that students and housewives perceive these sound sources as more frequent.

However, no significant correlations were found between the frequency of occurrence of the sound sources and the education level of the participants.

5.2.10. Correlations between Sound Source Frequency of Occurrence and Residential Environment

The relationship between the perception of the sound source frequency of occurrence and the changes in the residential environment is tested using Spearman's rho. The

correlation results show no correlations to weak correlations (Appendix D), where the most significant results are as the following:

1. Correlations with period since living in the house: Domesticated animals/pets (0.163), indicating that residents who are living for a higher period perceive this sound source as more frequent.
2. Correlations with house types: neighbour's movement (0.151) indicating that people with attached houses and apartments perceive this sound source as more frequent.
3. Correlations with the location of the apartment within the building: Planes/jets (0.178), which indicates a possibility for a higher perception of high frequency of occurrence for the apartments in the higher floors.
4. Correlations with the area of residence within Ankara: Trains and subways nearby (0.166), which indicate that residents of areas such as Polatli, Sincan and Yenimahalle perceive this sound source as more frequent, as the high speed train and metro lines pass from or nearby those areas.

5.2.11. Correlations between Sound Source Favourability and Demographics

Using Spearman's rho correlation test between the sound sources' favourability and the demographic data of the participants, no correlations to weak correlations are found between the two sets of parameters (Appendix C). While age had no significant correlations with the sound sources' favourability, the other factors yielded the following results (note: higher favourability is assigned to lower values in SPSS):

1. Correlations with Gender: religious sounds (0.150), shutters of shops (-0.161), people talking/ shouting in the street (-0.164), and talking/shouting in the house (-0.204), where the negative signs indicate that the corresponding sound sources are more favourable by females. Moreover, the positive signs indicate that the corresponding sound sources are more favourable by males.
2. Correlations with occupation: subway/trains passing by (-0.171), religious sounds (0.182), rain (0.202) and street animals (-0.151), where the negative sign indicate that the corresponding sound sources are more favourable by working persons and the retired people. Furthermore, the positive signs indicate that the

corresponding sound sources are more favourable by the students and housewives.

3. Correlations with level of Education: the majority of the sound sources are weakly correlated to the education level with a positive correlation factor, indicating that people with lower educational levels have higher favourability of the majority of the sound sources. Nonetheless, three sound sources are more favoured by higher education levels, which are religious sounds, rain, and urban birds.

5.2.12. Correlations between Sound Source Favourability and Residential Environment

The relationship between the sound sources' favourability and the residential environment data of the participants are correlated using Spearman's rho, where the results show no correlations to weak correlations between the two sets of parameters (Appendix D). While no significant correlations were found between the house type and the house location within the building, and the favourability of the sound source, some few correlations in regard to the period since the person is living in the house. Therefore, religious sounds (0.267) and rain (0.195), while the positive sign indicates that the higher the time period the residents spend in the house the less favourable these sounds become.

5.3. Comparison of the Results with the Previous Studies

As this case study compared the soundscape perception of two different cultural groups, it would be beneficial to compare the results with the previous studies on the subjects, especially with the ones that share the same methodology, factors or parameters. Yu and Kang (2014) compared the soundscape perception of the residents of two different cities, which are Sheffield in UK and Taipei in Taiwan. As discussed previously, the two study groups of Yu and Kang (2014) showed lower means for Sheffield in comparison with Taipei in terms of annoyance, noticeability and sleep disturbance associated with thirteen sound sources in both case studies.

Nonetheless, the results of the present case study show that two different cultural groups residing in the same city can have different levels of satisfactions from the city's sound environment. Subsequently, this means that based on cultural difference, different satisfaction levels and perception of the acoustic environment is possible, which is evident from the presented results, where the two compared groups of residents have different perception of the same sound sources in terms of loudness, frequency of occurrence and favourability. The overall results of the study suggest that the Arab residents of Ankara have a higher level of satisfaction from the acoustic environment of the city, which is evident through the mean scores presented in Tables 5.3 and 5.4.

However, the perception to different sounds in terms of perception of sound levels, frequency of occurrence and sound source favourability is distinguished among the different cultures even though if they were exposed to the same acoustic environment, which is reflected through the strong correlation through ANOVA testing of both factors with significant levels less than 0.05, as shown in Tables 5.6, 5.7, 5.8 and 5.9. Furthermore, in studying the difference between the Arab and Turkish residents' perception of the several sound sources included in the study, man-generated sounds have had varying correlation strengths to the cultural background of the perceiving individuals between loudness and frequency of occurrence. Several sound sources remained with a higher mean for the local Turkish group, while for favourability of sound sources the Arab group showed higher means, hence less favourability, for most of the artificial sound sources.

Nevertheless, natural sound sources have proven a strong correlation between the soundscape perception and the cultural background in loudness and frequency of occurrence through the high means for the Turkish group. In general, the overall evaluation of the sound sources shows different perception between the two study groups, where the Turkish group perceive most of the sound sources louder and more frequent. In the sound favourability part, the Arab group shows less favourability for the majority of the sound sources, which could be a reaction from the lack of familiarity

with the sound environment. This is evident from the results of the Turkish group, who seem to be more familiar and used to the sound environment of Ankara.

Moreover, parameters that could influence the soundscape perception such as gender are worth testing, to assess if the same correlations exist with other factors beside the cultural factor. In performing Spearman's rho testing with the demographic data of the questionnaire participants, and the importance of the sound environment, satisfaction from the sound environment, and the overall evaluation of the sound environment in the houses of Ankara, no strong correlations were found between the factors (results presented in Appendix C). Nonetheless, other studies have proven that members within the same household could have different perception and reaction towards the same sound source due to the meaning and function it implies (Oleksik, Frohlich, Brown, & Sellen, 2008). Therefore, there are other factors that could influence the soundscape perception of different sounds in the residential context, which are based on personal level of experience. Such factors are difficult to measure through the present study, which considers an overall assessment of the sound environment within the city houses.

6.CONCLUSION

Based on the results of the study, the hypotheses can be tested as the following using the means comparison between the two study groups in the different sections of the case study.

The first hypothesis of this study is structured as; 'the sound environment of the houses in Ankara is equally important for the Arab and Turkish residents'. According to the ANOVA testing of this hypothesis, the significance level was calculated as 0.424, which indicates that there is no relation between the importance of the house sound environment and the cultural background of an individual. Therefore, this hypothesis can be accepted based on a confidence level $p < 0.05$ of the ANOVA and t-test.

The second hypothesis of this study is structured as; 'the overall satisfaction of the sound environment of the residential context depends on the cultural background of the perceiver'. Through one-way ANOVA testing, the correlation between the satisfaction of the acoustic environment and the cultural background yielded a significance level of 0.000 based on a confidence level $p < 0.05$ of the ANOVA and t-test. Thus, this hypothesis is accepted.

The third hypothesis of this study is structured as; 'the overall soundscape perception of the acoustic environment within the residential context depends on the cultural background of the perceiving group'. Based on the ANOVA testing for the adjective assignments by the questionnaire participants, significance levels ranged between 0.000 and 0.017. Therefore, there is a strong correlation between the two parameters. Subsequently, this hypothesis is accepted based on a confidence level of $p < 0.05$ of the ANOVA and t-test.

The forth hypothesis of this study is structured as; ‘There is a correlation between the perception of the sound source loudness and the cultural background of the perceiver.’. ANOVA testing is performed to correlate the loudness perception of several sound sources to the cultural background of the questionnaire participants, where thirteen out of twenty-two sound sources yielded a significance level ranging between 0.000 and 0.047. Therefore, this hypothesis is accepted based on a confidence level $p < 0.05$ of the ANOVA and t-test.

The fifth hypothesis of this study is structured as; ‘There is a correlation between the perception of the sound source frequency of occurrence and the cultural background of the perceiver.’. ANOVA testing is performed to correlate the frequency of occurrence perception of several sound sources to the cultural background of the questionnaire participants, where ten out of twenty-two sound sources yielded a significance level ranging between 0.000 and 0.036. Therefore, this hypothesis is accepted based on a confidence level $p < 0.05$ of the ANOVA and t-test.

The sixth hypothesis of this study is structured as; ‘There is a correlation between the favourability sound source and the cultural background of the perceiver’.. ANOVA testing is performed to correlate the favourability of several sound sources to the cultural background of the questionnaire participants, where twenty out of twenty-two sound sources yielded a significance level ranging between 0.000 and 0.040. Therefore, this hypothesis is accepted based on a confidence level $p < 0.05$ of the ANOVA and t-test.

The seventh hypothesis of this study is structured as; ‘the importance given to the sound environment of the houses in Ankara depends on the demographical changes such as gender, education level and occupation’. Correlation testing using Spearman’s rho is performed to correlate the importance of the house sound environment to the demographic data of the questionnaire participants, where the only significant correlation was found as weak correlation with the gender factors (-.0127). Therefore, this hypothesis is partially accepted in regards with gender and rejected for age category, occupation and education level, based on confidence level of $p < 0.05$.

The eighth hypothesis of this study is structured as; ‘the importance given to the sound environment of the houses in Ankara depends on the residential environment changes’. Correlation testing using Spearman’s rho is performed to correlate the importance of the house sound environment to the residential environment data of the questionnaire participants, where no significant correlations were found. Therefore, this hypothesis is rejected, based on confidence level of $p < 0.05$.

The ninth hypothesis of this study is structured as; ‘the overall satisfaction of the sound environment of the residential context depends on the demographical changes such as gender, education level and occupation’. Correlation testing using Spearman’s rho is performed to correlate the satisfaction from the house sound environment to the demographic data of the questionnaire participants, where the only significant correlation was found as weak correlation with the occupation factor (-.0110). Therefore, this hypothesis is partially accepted in regards with occupation and rejected for gender, age category and education level, based on confidence level of $p < 0.05$.

The tenth hypothesis of this study is structured as; ‘the overall satisfaction of the sound environment of the residential context depends on the residential environment changes’. Correlation testing using Spearman’s rho is performed to correlate the satisfaction from the house sound environment to the demographic data of the questionnaire participants, where the only significant correlation was found as weak correlation with the living area in Ankara (-.0123). Therefore, this hypothesis is partially accepted in regards with the living area in Ankara and rejected for the period of living in the current house, house type, location of apartment within the building, and number of intermediate floor, based on confidence level of $p < 0.05$.

The eleventh hypothesis of this study is structured as; ‘the overall soundscape perception of the acoustic environment within the residential context depends on the demographical changes such as gender, education level and occupation’. Correlation testing using Spearman’s rho is performed to correlate the overall soundscape perception of the acoustic environment to the demographic data of the questionnaire

participants, where few weak correlations were found with the education level and the age category. Therefore, this hypothesis is partially accepted in regards with the education level and the age category, and rejected for the gender and occupation factors, based on confidence level of $p < 0.05$.

The twelfth hypothesis of this study is structured as; 'the overall soundscape perception of the acoustic environment within the residential context depends on the residential environment changes'. Correlation testing using Spearman's rho is performed to correlate the overall soundscape perception of the acoustic environment to the residential environment data of the questionnaire participants, where few weak correlations were found with the living area in Ankara. Therefore, this hypothesis is partially accepted in regards with the living area factor, and rejected for the period living in the current house, house type, location of apartment within the building, and number of intermediate floor, based on confidence level of $p < 0.05$.

The thirteenth hypothesis of this study is structured as; 'there is a correlation between the perception of the sound source loudness and the demographical changes such as gender, education level and occupation'. Correlation testing using Spearman's rho is performed to correlate the perception of the sound source loudness to the demographic data of the questionnaire participants, where few weak correlations were found with the gender and the age category and minor weak correlations were found for the occupation and level of education factors. Therefore, this hypothesis is partially accepted in regards with all the demographic factors, based on confidence level of $p < 0.05$.

The fourteenth hypothesis of this study is structured as; 'there is a correlation between the perception of the sound source loudness and the residential environment changes'. Correlation testing using Spearman's rho is performed to correlate the perception of the sound source loudness to the residential environment data of the questionnaire participants, where few weak correlations were found with period since living in the current house, house type and the location of the apartment within the building.

Therefore, this hypothesis is partially accepted in regards with these factors, and rejected for the living area in Ankara for no correlation, based on confidence level of $p < 0.05$.

The fifteenth hypothesis of this study is structured as; 'there is a correlation between the perception of the sound source frequency of occurrence and the demographical changes such as gender, education level and occupation'. Correlation testing using Spearman's rho is performed to correlate the perception of the sound source frequency of occurrence to the demographic data of the questionnaire participants, where few weak correlations were found with gender, age category and occupation. Therefore, this hypothesis is partially accepted in regards with these factors, and rejected for the level of education for no correlation, based on confidence level of $p < 0.05$.

The sixteenth hypothesis of this study is structured as; 'there is a correlation between the perception of the sound source frequency of occurrence and the residential environment changes'. Correlation testing using Spearman's rho is performed to correlate the perception of the sound source frequency of occurrence to the residential environment data of the participants, where few weak correlations were found with all the corresponding factors. Therefore, this hypothesis is partially accepted in regards with these factors, since not all sound sources are correlated, based on confidence level of $p < 0.05$.

The seventeenth hypothesis of this study is structured as; 'there is a correlation between the favourability sound source and the demographical changes such as gender, education level and occupation'. Correlation testing using Spearman's rho is performed to correlate the perception of the sound source favourability to the demographic data of the participants, where few weak correlations were found with the gender, occupation and educational level. Therefore, this hypothesis is partially accepted in regards with these factors, and rejected for the age category based on confidence level of $p < 0.05$.

The eighteenth hypothesis of this study is structured as; 'there is a correlation between the favourability sound source and the residential environment changes'. Correlation

testing using Spearman's rho is performed to correlate the perception of the sound source favourability to the residential environment data of the participants, where very few weak correlations were found with the house location within the building, and no correlations were found with the other factors. Therefore, this hypothesis is partially accepted in regards with house location within the building, and rejected for the other factors, based on confidence level of $p < 0.05$.

Furthermore, the literature suggests that the soundscape perception of any context does not only depend on the acoustic environment of the place, but also the auditory perception, which is influenced by the physiological, psychological and cultural background of a person. The results of this case study took into consideration the housing type of both resident groups in the city, in terms of house types, location and floor levels. However, there was minimal impact on the results of the study by these factors, which is proven through a higher satisfaction level from the Arab residents (Table 5.3), while 39.4% of them live in the basement and ground floor compared to 26.5% for the Turkish residents living on same levels.

Moreover, both study groups indicated that they spend the similar time periods in their houses (Table 4.9), which leaves the cultural factors for comparison through the acoustic perception evaluation by the two participant groups. As tested by the hypotheses earlier, it was proven that people under the same acoustic environment and context may develop different perception for the urban soundscape based on their cultural differences.

In the future and based on the results of this research, it would be beneficial to investigate the correlation between the soundscape perception in the residential contexts according to other social and cultural factors. Future work could also include similar studies of this research to be performed on other cities around the world with cultural diversity in order to compare the results with this study and understand the extent of the cultural influence on the soundscape perception.

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APPENDIX A:
Residential Indoor Soundscape Evaluation Questionnaire

1) Gender: ☐ Male ☐ Female

2) Age: …….....…

3) Occupation: (Proposed drop list)

☐Student ☐ Housewife ☐ Working person ☐ Retired ☐ Other ……

4) Education Level: (Proposed drop list)

☐ Elementary School ☐ Middle School ☐ High School

☐ University ☐ Master's Degree ☐ Doctoral Degree

5) Nationality: (Proposed drop list)

☐ Libya ☐ Syria ☐ Iraq ☐ Egypt

☐ Jordan ☐ Palestine ☐ Saudi Arabia ☐ Other……..

6) How long have you been living in this house?

☐ 0-1 years ☐ 1-5 years ☐ 5-10 years ☐ more than 10 years

7) What is your house type?

☐Detached house ☐Attached house ☐ Terraced house ☐ Apartment

☐Other……

8) If you are living in a multi-story apartment, which floor is your house located on?

☐ Basement ☐ Ground floor ☐ Intermediate floor ☐ Top floor

9) If you are living on an intermediate floor of a multi-story apartment, which floor is your house located on?

…….

10) In which area in Ankara do you live?

Municipality (drop lists)

11) Please sort the time periods that you spend at your house during a week defined below from shortest being rating-1 to longest being rating-4?

	1	2	3	4
Morning (between 06:00-12:00)	☐	☐	☐	☐
Afternoon (between 12:00-18:00)	☐	☐	☐	☐
Evening (between 18:00-24:00)	☐	☐	☐	☐
Midnight (between 24:00-06:00)	☐	☐	☐	☐

11) What do you think about the **importance** of the sound environment in your house?

Very important	Important	Unimportant	Very unimportant
☐	☐	☐	☐

12) How **satisfied** are you with the overall sound environment at your house in Ankara?

Very satisfied	Satisfied	Dissatisfied	Very dissatisfied
☐	☐	☐	☐

13) How do you **describe** the overall acoustic environment at your house in Ankara?

1.	Very quiet	Quiet	Noisy	Very Noisy
	☐	☐	☐	☐
2.	Very good	Good	Bad	Very bad
	☐	☐	☐	☐
3.	Very pleasant	Pleasant	Unpleasant	Very unpleasant
	☐	☐	☐	☐
4.	Very peaceful	Peaceful	Stressing	Very stressing
	☐	☐	☐	☐
5.	Very comfortable	Comfortable	Uncomfortable	Very uncomfortable
	☐	☐	☐	☐
6.	Very positive	Positive	Negative	Very negative
	☐	☐	☐	☐
7.	Very favourable	Favourable	Unfavourable	Very unfavourable
	☐	☐	☐	☐
8.	Very calm	Calm	Agitating	Very agitating
	☐	☐	☐	☐

14) Can you choose the sound level ranging from very quiet to very loud for the listed sounds that you hear in your house?

Sound level of;	I DON'T HEAR IT	VERY LOW SOUND LEVEL	LOW SOUND LEVEL	HIGH SOUND LEVEL	VERY HIGH SOUND LEVEL
	0	**1**	**2**	**3**	**4**
1. Planes, jets, and helicopters that are passing by					
2. Trains or subway trains that are passing by					
3. Motorcycles, cars, buses, and trucks that are passing by					
4. Horns from vehicles					
5. Police/ambulance sirens					
6. Nearby schools (children shouting, bells, etc.)					
7. Religious sounds (azan, church bell, etc.)					
8. Shutters of shops / markets					
9. Nearby Construction					
10.People on the street (talking, walking, etc.)					
11.Domestic equipment in your house					
12.Talking, shouting in your house					
13.Movement in your house (walking, furniture, doors)					
14.Neighbours' talking, shouting					
15.Neighbours' domestic equipment					
16.Neighbours' movement (walking, furniture, doors)					
17.Drainage systems/water pipes					
18.Rain					
19.Wind					
20.Domesticated animals (cats, dogs, birds, etc.)					
21.Street animals (dogs, cats)					
22.Urban birds					
23.Other……..……					
24.Other……..……					
25.Other……..……					

15) How frequently do you hear the below listed sounds in your house? Please rate on a scale ranging from very infrequent to very frequent.

Sounds that are coming from;	SOUND DOES NOT OCCUR	VERY INFREQUENT	INFREQUENT	FREQUENT	VERY FREQUENT
	0	**1**	**2**	**3**	**4**
1. Planes, jets, and helicopters that are passing by					
2. Trains or subway trains that are passing by					
3. Motorcycles, cars, buses, and trucks that are passing by					
4. Horns from vehicles					
5. Police/ambulance sirens					
6. Nearby schools (children shouting, bells, etc.)					
7. Religious sounds (azan, church bell, etc.)					
8. Shutters of shops / markets					
9. Nearby Construction					
10. People on the street (talking, walking, etc.)					
11. Domestic equipment in your house					
12. Talking, shouting in your house					
13. Movement in your house (walking, furniture, doors)					
14. Neighbours' talking, shouting					
15. Neighbours' domestic equipment					
16. Neighbours' movement (walking, furniture, doors)					
17. Drainage systems/water pipes					
18. Rain					
19. Wind					
20. Domesticated animals (cats, dogs, birds, etc.)					
21. Street animals (dogs, cats)					
22. Urban birds					
23. Other……..……					
24. Other……..……					
25. Other……..……					

16) Can you rate each sound source that you hear in your house ranging from very favourable to very unfavourable?

Sounds that are coming from;	VERY FAVOURABLE	FAVOURABLE	UNFAVOURABLE	VERY UNFAVOURABLE
	1	**2**	**3**	**4**
1. Planes, jets, and helicopters that are passing by				
2. Trains or subway trains that are passing by				
3. Motorcycles, cars, buses, and trucks that are passing by				
4. Horns from vehicles				
5. Police/ambulance sirens				
6. Nearby schools (children shouting, bells, etc.)				
7. Religious sounds (azan, church bell, etc.)				
8. Shutters of shops / markets				
9. Nearby Construction				
10. People on the street (talking, walking, etc.)				
11. Domestic equipment in your house				
12. Talking, shouting in your house				
13. Movement in your house (walking, furniture, doors)				
14. Neighbours' talking, shouting				
15. Neighbours' domestic equipment				
16. Neighbours' movement (walking, furniture, doors)				
17. Drainage systems/water pipes				
18. Rain				
19. Wind				
20. Domesticated animals (cats, dogs, birds, etc.)				
21. Street animals (dogs, cats)				
22. Urban birds				
23. Other……..……				
24. Other……..……				
25. Other……..……				

APPENDIX B:

Independent Samples t-test Correlation Tables

Independent Samples Test

Sound environment importance t-test		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Importance of Sound Environment	Equal variances assumed	4.004	.046	.800	403	.424	.054	.068	-.079	.188
	Equal variances not assumed			.800	396.754	.424	.054	.068	-.079	.188

Independent Samples Test

Sound environment satisfaction t-test		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Satisfaction from sound environment	Equal variances assumed	16.614	.000	-4.245	403	.000	-.300	.071	-.438	-.161
	Equal variances not assumed			-4.249	396.676	.000	-.300	.071	-.438	-.161

Independent Samples Test

Overall Soundscape Evaluation Adjectives t-test		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Quietness	Equal variances assumed	18.631	.000	-5.864	403	.000	-.389	.066	-.519	-.258
	Equal variances not assumed			-5.872	391.670	.000	-.389	.066	-.519	-.258
Goodness	Equal variances assumed	1.879	.171	-4.522	403	.000	-.296	.065	-.424	-.167
	Equal variances not assumed			-4.525	399.859	.000	-.296	.065	-.424	-.167
Pleasantness	Equal variances assumed	17.130	.000	-2.820	403	.005	-.191	.068	-.324	-.058
	Equal variances not assumed			-2.824	391.973	.005	-.191	.068	-.324	-.058
Stressfulness	Equal variances assumed	8.584	.004	-3.630	403	.000	-.241	.067	-.372	-.111
	Equal variances not assumed			-3.636	386.310	.000	-.241	.066	-.372	-.111
Comfort	Equal variances assumed	12.191	.001	-2.394	403	.017	-.162	.068	-.296	-.029
	Equal variances not assumed			-2.399	381.238	.017	-.162	.068	-.296	-.029
Positivity	Equal variances assumed	11.032	.001	-3.363	403	.001	-.212	.063	-.336	-.088
	Equal variances not assumed			-3.368	386.000	.001	-.212	.063	-.335	-.088
Favourability	Equal variances assumed	9.239	.003	-2.760	403	.006	-.177	.064	-.303	-.051
	Equal variances not assumed			-2.764	389.581	.006	-.177	.064	-.303	-.051
Calmness	Equal variances assumed	32.715	.000	-2.877	403	.004	-.190	.066	-.320	-.060
	Equal variances not assumed			-2.883	375.277	.004	-.190	.066	-.320	-.060

Independent Samples Test

Sound Source Loudness t-test		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Planes, jets, and helicopters	Equal variances assumed	23,285	,000	6,555	403	,000	,722	,110	,505	,938
	Equal variances not assumed			6,568	381,643	,000	,722	,110	,506	,938
Trains or subway trains	Equal variances assumed	7,272	,007	1,335	403	,183	,109	,082	-,052	,270
	Equal variances not assumed			1,337	382,241	,182	,109	,082	-,051	,269
Motorcycles, cars, buses, and trucks	Equal variances assumed	2,494	,115	,527	403	,599	,060	,114	-,164	,284
	Equal variances not assumed			,527	395,775	,598	,060	,114	-,164	,284
Horns from vehicle	Equal variances assumed	4,863	,028	3,425	403	,001	,387	,113	,165	,608
	Equal variances not assumed			3,429	393,980	,001	,387	,113	,165	,608
Police/ambulance sirens	Equal variances assumed	4,091	,044	1,744	403	,082	,209	,120	-,027	,444
	Equal variances not assumed			1,743	401,736	,082	,209	,120	-,027	,444
Nearby schools	Equal variances assumed	2,882	,090	2,854	403	,005	,375	,131	,117	,634
	Equal variances not assumed			2,855	402,123	,005	,375	,131	,117	,633
Religious sounds	Equal variances assumed	2,793	,095	,807	403	,420	,085	,106	-,123	,294
	Equal variances not assumed			,808	400,284	,420	,085	,106	-,123	,293
Shutters of shops / markets	Equal variances assumed	12,632	,000	2,201	403	,028	,218	,099	,023	,413
	Equal variances not assumed			2,205	384,819	,028	,218	,099	,024	,412
Nearby Construction	Equal variances assumed	31,846	,000	4,200	403	,000	,464	,110	,247	,681
	Equal variances not assumed			4,210	371,162	,000	,464	,110	,247	,681
People on the street	Equal variances assumed	29,289	,000	1,724	403	,085	,176	,102	-,025	,377
	Equal variances not assumed			1,727	380,783	,085	,176	,102	-,024	,377
Domestic equipment in your house	Equal variances assumed	1,491	,223	-3,178	403	,002	-,307	,097	-,497	-,117
	Equal variances not assumed			-3,177	399,730	,002	-,307	,097	-,497	-,117
Talking, shouting in your house	Equal variances assumed	,024	,878	-1,659	403	,098	-,175	,106	-,383	,032
	Equal variances not assumed			-1,659	402,991	,098	-,175	,106	-,383	,032
Movement in your house	Equal variances assumed	,495	,482	-1,996	403	,047	-,207	,104	-,411	-,003
	Equal variances not assumed			-1,997	402,488	,046	-,207	,104	-,411	-,003
Neighbours talking, shouting	Equal variances assumed	6,217	,013	3,814	403	,000	,436	,114	,211	,660
	Equal variances not assumed			3,818	393,469	,000	,436	,114	,211	,660
Neighbours' domestic equipment	Equal variances assumed	16,030	,000	1,811	403	,071	,203	,112	-,017	,423
	Equal variances not assumed			1,814	387,158	,070	,203	,112	-,017	,423
Neighbours' movement	Equal variances assumed	6,909	,009	,605	403	,546	,067	,111	-,151	,285
	Equal variances not assumed			,605	395,649	,545	,067	,111	-,151	,285
Drainage systems/ water pipes	Equal variances assumed	1,665	,198	-,802	403	,423	-,090	,112	-,310	,130
	Equal variances not assumed			-,802	401,285	,423	-,090	,112	-,310	,130
Rain	Equal variances assumed	29,575	,000	6,173	403	,000	,633	,103	,431	,834
	Equal variances not assumed			6,185	380,454	,000	,633	,102	,432	,834
Wind	Equal variances assumed	40,684	,000	7,563	403	,000	,798	,106	,591	1,006
	Equal variances not assumed			7,582	363,385	,000	,798	,105	,591	1,005
Domesticated animals	Equal variances assumed	38,001	,000	5,490	403	,000	,605	,110	,388	,822
	Equal variances not assumed			5,503	367,903	,000	,605	,110	,389	,821
Street animals (dogs, cats)	Equal variances assumed	11,944	,001	4,404	403	,000	,493	,112	,273	,712
	Equal variances not assumed			4,409	395,716	,000	,493	,112	,273	,712
Urban birds	Equal variances assumed	32,975	,000	5,315	403	,000	,585	,110	,369	,802
	Equal variances not assumed			5,326	375,093	,000	,585	,110	,369	,802

Independent Samples Test

Sound Source Frequency of Occurrence t-test		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Planes, jets, and helicopters	Equal variances assumed	26,934	,000	5,247	403	,000	,570	,109	,357	,784
	Equal variances not assumed			5,257	382,308	,000	,570	,109	,357	,784
Trains or subway trains	Equal variances assumed	14,683	,000	2,103	403	,036	,173	,082	,011	,335
	Equal variances not assumed			2,107	379,279	,036	,173	,082	,012	,334
Motorcycles, cars, buses, and trucks	Equal variances assumed	,581	,446	-,108	403	,914	-,013	,121	-,251	,225
	Equal variances not assumed			-,108	402,990	,914	-,013	,121	-,251	,225
Horns from vehicle	Equal variances assumed	,198	,657	1,546	403	,123	,180	,116	-,049	,408
	Equal variances not assumed			1,547	402,713	,123	,180	,116	-,049	,408
Police/ambulance sirens	Equal variances assumed	,605	,437	1,927	403	,055	,236	,122	-,005	,476
	Equal variances not assumed			1,928	402,561	,055	,236	,122	-,005	,476
Nearby schools	Equal variances assumed	1,575	,210	1,500	403	,134	,197	,132	-,061	,456
	Equal variances not assumed			1,501	402,217	,134	,197	,131	-,061	,456
Religious sounds	Equal variances assumed	,133	,715	-1,757	403	,080	-,212	,121	-,450	,025
	Equal variances not assumed			-1,757	402,829	,080	-,212	,121	-,450	,025
Shutters of shops / markets	Equal variances assumed	6,071	,014	,896	403	,371	,085	,095	-,101	,271
	Equal variances not assumed			,897	392,754	,370	,085	,095	-,101	,271
Nearby Construction	Equal variances assumed	10,587	,001	2,880	403	,004	,316	,110	,100	,532
	Equal variances not assumed			2,885	386,778	,004	,316	,110	,101	,532
People on the street	Equal variances assumed	3,627	,058	-,746	403	,456	-,083	,112	-,303	,136
	Equal variances not assumed			-,747	398,782	,456	-,083	,112	-,303	,136
Domestic equipment in your house	Equal variances assumed	2,132	,145	-2,436	403	,015	-,267	,110	-,483	-,052
	Equal variances not assumed			-2,438	401,393	,015	-,267	,110	-,483	-,052
Talking, shouting in your house	Equal variances assumed	,954	,329	,459	403	,646	,053	,116	-,174	,281
	Equal variances not assumed			,459	401,859	,646	,053	,116	-,174	,280
Movement in your house	Equal variances assumed	11,793	,001	-,540	403	,589	-,059	,109	-,274	,156
	Equal variances not assumed			-,541	391,504	,589	-,059	,109	-,274	,156
Neighbours talking, shouting	Equal variances assumed	4,471	,035	2,389	403	,017	,276	,116	,049	,504
	Equal variances not assumed			2,392	396,497	,017	,276	,115	,049	,503
Neighbours' domestic equipment	Equal variances assumed	9,883	,002	,769	403	,442	,087	,114	-,136	,311
	Equal variances not assumed			,770	392,188	,442	,087	,113	-,136	,310
Neighbours' movement	Equal variances assumed	4,648	,032	,751	403	,453	,086	,114	-,139	,311
	Equal variances not assumed			,751	398,964	,453	,086	,114	-,139	,311
Drainage systems/ water pipes	Equal variances assumed	,014	,906	-1,825	403	,069	-,225	,123	-,467	,017
	Equal variances not assumed			-1,825	402,859	,069	-,225	,123	-,467	,017
Rain	Equal variances assumed	23,436	,000	4,624	403	,000	,486	,105	,279	,692
	Equal variances not assumed			4,632	386,073	,000	,486	,105	,279	,692
Wind	Equal variances assumed	24,671	,000	6,185	403	,000	,650	,105	,443	,857
	Equal variances not assumed			6,197	380,769	,000	,650	,105	,444	,856
Domesticated animals	Equal variances assumed	18,660	,000	3,316	403	,001	,382	,115	,155	,608
	Equal variances not assumed			3,322	383,923	,001	,382	,115	,156	,608
Street animals (dogs, cats)	Equal variances assumed	8,552	,004	3,779	403	,000	,452	,120	,217	,687
	Equal variances not assumed			3,782	397,969	,000	,452	,119	,217	,687
Urban birds	Equal variances assumed	10,583	,001	2,342	403	,020	,277	,118	,045	,510
	Equal variances not assumed			2,344	396,481	,020	,277	,118	,045	,510

Independent Samples Test

Sound Source Favourability t-test		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Planes, jets, and helicopters	Equal variances assumed	1,826	,177	-4,299	403	,000	-,365	,085	-,532	-,198
	Equal variances not assumed			-4,302	399,581	,000	-,365	,085	-,532	-,198
Trains or subway trains	Equal variances assumed	22,107	,000	-9,568	403	,000	-,800	,084	-,964	-,635
	Equal variances not assumed			-9,588	373,804	,000	-,800	,083	-,964	-,636
Motorcycles, cars, buses, and trucks	Equal variances assumed	,009	,926	-4,512	403	,000	-,357	,079	-,513	-,202
	Equal variances not assumed			-4,516	398,613	,000	-,357	,079	-,513	-,202
Horns from vehicle	Equal variances assumed	,298	,585	-3,152	403	,002	-,244	,078	-,397	-,092
	Equal variances not assumed			-3,156	393,050	,002	-,244	,077	-,396	-,092
Police/ambulance sirens	Equal variances assumed	,848	,358	-4,173	403	,000	-,331	,079	-,488	-,175
	Equal variances not assumed			-4,176	400,963	,000	-,331	,079	-,487	-,175
Nearby schools	Equal variances assumed	4,516	,034	-2,338	403	,020	-,204	,087	-,375	-,032
	Equal variances not assumed			-2,340	400,794	,020	-,204	,087	-,375	-,033
Religious sounds	Equal variances assumed	19,291	,000	11,405	403	,000	1,004	,088	,831	1,178
	Equal variances not assumed			11,418	395,361	,000	1,004	,088	,831	1,177
Shutters of shops / markets	Equal variances assumed	24,346	,000	-6,773	403	,000	-,577	,085	-,745	-,410
	Equal variances not assumed			-6,786	377,581	,000	-,577	,085	-,744	-,410
Nearby Construction	Equal variances assumed	2,010	,157	-3,595	403	,000	-,297	,083	-,460	-,135
	Equal variances not assumed			-3,599	396,318	,000	-,297	,083	-,460	-,135
People on the street	Equal variances assumed	,001	,981	-1,791	403	,074	-,144	,080	-,302	,014
	Equal variances not assumed			-1,791	402,882	,074	-,144	,080	-,302	,014
Domestic equipment in your house	Equal variances assumed	9,752	,002	-3,329	403	,001	-,249	,075	-,397	-,102
	Equal variances not assumed			-3,331	401,352	,001	-,249	,075	-,397	-,102
Talking, shouting in your house	Equal variances assumed	1,146	,285	-1,597	403	,111	-,126	,079	-,281	,029
	Equal variances not assumed			-1,596	398,902	,111	-,126	,079	-,281	,029
Movement in your house	Equal variances assumed	6,860	,009	-4,114	403	,000	-,281	,068	-,415	-,147
	Equal variances not assumed			-4,117	398,797	,000	-,281	,068	-,415	-,147
Neighbours talking, shouting	Equal variances assumed	2,262	,133	-2,060	403	,040	-,146	,071	-,285	-,007
	Equal variances not assumed			-2,063	392,875	,040	-,146	,071	-,285	-,007
Neighbours' domestic equipment	Equal variances assumed	,666	,415	-3,969	403	,000	-,274	,069	-,409	-,138
	Equal variances not assumed			-3,977	374,034	,000	-,274	,069	-,409	-,138
Neighbours' movement	Equal variances assumed	,548	,460	-4,910	403	,000	-,343	,070	-,480	-,205
	Equal variances not assumed			-4,919	382,274	,000	-,343	,070	-,480	-,206
Drainage systems/ water pipes	Equal variances assumed	,342	,559	-6,216	403	,000	-,467	,075	-,614	-,319
	Equal variances not assumed			-6,228	382,633	,000	-,467	,075	-,614	-,319
Rain	Equal variances assumed	9,278	,002	6,850	403	,000	,615	,090	,439	,792
	Equal variances not assumed			6,855	400,085	,000	,615	,090	,439	,792
Wind	Equal variances assumed	7,766	,006	-3,019	403	,003	-,252	,083	-,416	-,088
	Equal variances not assumed			-3,021	399,339	,003	-,252	,083	-,416	-,088
Domesticated animals	Equal variances assumed	1,797	,181	-8,611	403	,000	-,719	,084	-,884	-,555
	Equal variances not assumed			-8,615	401,977	,000	-,719	,084	-,884	-,555
Street animals (dogs, cats)	Equal variances assumed	2,166	,142	-8,159	403	,000	-,676	,083	-,839	-,513
	Equal variances not assumed			-8,165	400,608	,000	-,676	,083	-,839	-,513
Urban birds	Equal variances assumed	12,355	,000	4,109	403	,000	,373	,091	,194	,551
	Equal variances not assumed			4,110	402,611	,000	,373	,091	,194	,551

APPENDIX C:
Correlations between Soundscape Perception and Demographical Factors

Correlation between importance of the sound environment and demographic data:

Correlations

			Gender	Age Category	Occupation	Education Level	Importance of Sound Environment
Spearman's rho	Gender	Correlation Coefficient	1,000	-,184**	,077	-,167**	-,127*
		Sig. (2-tailed)	.	,000	,121	,001	,010
		N	405	405	405	405	405
	Age Category	Correlation Coefficient	-,184**	1,000	,342**	,032	,097
		Sig. (2-tailed)	,000	.	,000	,515	,050
		N	405	405	405	405	405
	Occupation	Correlation Coefficient	,077	,342**	1,000	-,414**	,042
		Sig. (2-tailed)	,121	,000	.	,000	,401
		N	405	405	405	405	405
	Education Level	Correlation Coefficient	-,167**	,032	-,414**	1,000	,074
		Sig. (2-tailed)	,001	,515	,000	.	,135
		N	405	405	405	405	405
	Importance of Sound Environment	Correlation Coefficient	-,127*	,097	,042	,074	1,000
		Sig. (2-tailed)	,010	,050	,401	,135	.
		N	405	405	405	405	405

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Correlation between the satisfaction from the sound environment and demographical data:

Correlations

			Satisfaction from sound environment	Gender	Age Category	Occupation	Education Level
Spearman's rho	Satisfaction from sound environment	Correlation Coefficient	1,000	-,066	,046	-,110*	,094
		Sig. (2-tailed)	.	,186	,354	,027	,058
		N	405	405	405	405	405
	Gender	Correlation Coefficient	-,066	1,000	-,184**	,077	-,167**
		Sig. (2-tailed)	,186	.	,000	,121	,001
		N	405	405	405	405	405
	Age Category	Correlation Coefficient	,046	-,184**	1,000	,342**	,032
		Sig. (2-tailed)	,354	,000	.	,000	,515
		N	405	405	405	405	405
	Occupation	Correlation Coefficient	-,110*	,077	,342**	1,000	-,414**
		Sig. (2-tailed)	,027	,121	,000	.	,000
		N	405	405	405	405	405
	Education Level	Correlation Coefficient	,094	-,167**	,032	-,414**	1,000
		Sig. (2-tailed)	,058	,001	,515	,000	.
		N	405	405	405	405	405

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

Correlation between the overall soundscape perception and demographics:

Correlations

			Gender	Age Category	Occupation	Education Level
Spearman's rho	Quietness	Correlation Coefficient	,094	-,088	,063	-,119*
		Sig. (2-tailed)	,058	,078	,206	,017
		N	405	405	405	405
	Goodness	Correlation Coefficient	,077	-,118*	-,011	-,108*
		Sig. (2-tailed)	,122	,017	,826	,030
		N	405	405	405	405
	Pleasantness	Correlation Coefficient	,035	-,052	,017	-,077
		Sig. (2-tailed)	,480	,299	,739	,123
		N	405	405	405	405
	Peacefulness	Correlation Coefficient	,043	-,064	-,010	-,109*
		Sig. (2-tailed)	,387	,202	,845	,028
		N	405	405	405	405
	Comfort	Correlation Coefficient	,045	-,046	-,010	-,055
		Sig. (2-tailed)	,363	,357	,843	,267
		N	405	405	405	405
	Positivity	Correlation Coefficient	,052	-,086	-,009	-,099*
		Sig. (2-tailed)	,298	,085	,854	,046
		N	405	405	405	405
	Favourability	Correlation Coefficient	,091	-,045	,039	-,109*
		Sig. (2-tailed)	,066	,369	,431	,029
		N	405	405	405	405
	Calmness	Correlation Coefficient	,058	-,106*	-,004	-,065
		Sig. (2-tailed)	,246	,034	,936	,191
		N	405	405	405	405

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Correlation between the perception of the sound source loudness and demographics:

Correlations

			Gender	Age Category	Occupation	Education Level
Spearman's rho	Sound level of planes, jets, and helicopters that are passing by	Correlation Coefficient	,012	-,103*	-,005	-,071
		Sig. (2-tailed)	,805	,038	,926	,154
		N	405	405	405	405
	Sound level of trains or subway trains that are passing by	Correlation Coefficient	-,011	-,137**	-,006	-,029
		Sig. (2-tailed)	,826	,006	,898	,555
		N	405	405	405	405
	Sound level of motorcycles, cars, buses, and trucks that are passing by	Correlation Coefficient	,069	-,149**	-,098*	,087
		Sig. (2-tailed)	,167	,003	,050	,082
		N	405	405	405	405
	Sound level of horns from vehicle	Correlation Coefficient	,095	-,125*	-,029	,010
		Sig. (2-tailed)	,057	,012	,561	,842
		N	405	405	405	405
	Sound level of police/ambulance sirens	Correlation Coefficient	,075	-,028	-,059	,036
		Sig. (2-tailed)	,132	,573	,237	,470
		N	405	405	405	405
	Sound level of nearby schools (children shouting, bells, etc.)	Correlation Coefficient	,112*	-,172**	-,127*	-,088
		Sig. (2-tailed)	,024	,001	,011	,078
		N	405	405	405	405
	Sound level of religious sounds (azan, church bell, etc.)	Correlation Coefficient	,063	-,103*	-,056	-,112*
		Sig. (2-tailed)	,204	,038	,260	,024
		N	405	405	405	405
	Sound level of shutters of shops / markets	Correlation Coefficient	,019	-,135**	-,054	-,091
		Sig. (2-tailed)	,707	,006	,279	,067
		N	405	405	405	405
	Sound level of nearby Construction	Correlation Coefficient	,094	-,186**	-,055	-,090
		Sig. (2-tailed)	,060	,000	,269	,069
		N	405	405	405	405
	Sound level of people on the street (talking, walking, etc.)	Correlation Coefficient	,175**	-,199**	-,079	-,046
		Sig. (2-tailed)	,000	,000	,113	,356
		N	405	405	405	405
	Sound level of domestic equipment in your house	Correlation Coefficient	,067	-,097	-,127*	,187**
		Sig. (2-tailed)	,177	,051	,011	,000
		N	405	405	405	405
	Sound level of talking, shouting in your house	Correlation Coefficient	,165**	-,134**	-,136**	,057
		Sig. (2-tailed)	,001	,007	,006	,252
		N	405	405	405	405
	Sound level of movement in your house (walking, furniture, doors)	Correlation Coefficient	,164**	-,131**	-,097	,091
		Sig. (2-tailed)	,001	,008	,051	,067
		N	405	405	405	405
	Sound level of neighbours talking, shouting	Correlation Coefficient	,197**	-,199**	-,029	-,028
		Sig. (2-tailed)	,000	,000	,566	,568
		N	405	405	405	405
	Sound level of neighbours' domestic equipment	Correlation Coefficient	,114*	-,090	-,001	-,015
		Sig. (2-tailed)	,021	,069	,989	,760
		N	405	405	405	405
	Sound level of neighbours' movement (walking, furniture, doors)	Correlation Coefficient	,109*	-,113*	-,062	,076
		Sig. (2-tailed)	,028	,023	,216	,126
		N	405	405	405	405
	Sound level of drainage systems/ water pipes	Correlation Coefficient	,111*	-,058	-,072	,093
		Sig. (2-tailed)	,026	,244	,150	,061
		N	405	405	405	405
	Sound level of rain	Correlation Coefficient	,060	-,072	,014	-,036
		Sig. (2-tailed)	,226	,150	,779	,466
		N	405	405	405	405
	Sound level of wind	Correlation Coefficient	,030	-,105*	,040	-,046
		Sig. (2-tailed)	,542	,034	,427	,359
		N	405	405	405	405
	Sound level of domesticated animals (cats, dogs, birds, etc.)	Correlation Coefficient	,021	-,014	,104*	-,074
		Sig. (2-tailed)	,676	,777	,036	,135
		N	405	405	405	405
	Sound level of street animals (dogs, cats)	Correlation Coefficient	,133**	-,152**	,051	-,089
		Sig. (2-tailed)	,007	,002	,302	,073
		N	405	405	405	405
	Sound level of urban birds	Correlation Coefficient	,134**	-,162**	,020	-,053
		Sig. (2-tailed)	,007	,001	,682	,292
		N	405	405	405	405

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

Correlation between the perception of the sound source frequency of occurrence and demographics:

Correlations

			Gender	Age Category	Occupation	Education Level
Spearman's rho	Frequency of sound of planes, jets, and helicopters that are passing by	Correlation Coefficient	,025	-,048	,029	-,016
		Sig. (2-tailed)	,616	,336	,567	,748
		N	405	405	405	405
	Frequency of sound of trains or subway trains that are passing by	Correlation Coefficient	,006	-,151**	-,061	-,057
		Sig. (2-tailed)	,901	,002	,221	,254
		N	405	405	405	405
	Frequency of sound of motorcycles, cars, buses, and trucks that are passing by	Correlation Coefficient	,107*	-,139**	-,096	,040
		Sig. (2-tailed)	,031	,005	,054	,424
		N	405	405	405	405
	Frequency of sound of horns from vehicle	Correlation Coefficient	,097	-,142**	-,077	,010
		Sig. (2-tailed)	,051	,004	,124	,833
		N	405	405	405	405
	Frequency of sound of police/ambulance sirens	Correlation Coefficient	,119*	-,088	-,035	-,059
		Sig. (2-tailed)	,017	,076	,488	,239
		N	405	405	405	405
	Frequency of sound of nearby schools (children shouting, bells, etc.)	Correlation Coefficient	,183**	-,173**	-,131**	-,078
		Sig. (2-tailed)	,000	,000	,008	,115
		N	405	405	405	405
	Frequency of sound religious sounds (azan, church bell, etc.)	Correlation Coefficient	,037	-,034	-,059	,027
		Sig. (2-tailed)	,454	,494	,233	,589
		N	405	405	405	405
	Frequency of sound of shutters of shops / markets	Correlation Coefficient	,035	-,118*	-,113*	-,076
		Sig. (2-tailed)	,483	,017	,023	,129
		N	405	405	405	405
	Frequency of sound of nearby Construction	Correlation Coefficient	,117*	-,177**	-,087	-,040
		Sig. (2-tailed)	,018	,000	,080	,426
		N	405	405	405	405
	Frequency of sound of people on the street (talking, walking, etc.)	Correlation Coefficient	,137**	-,138**	-,167**	,025
		Sig. (2-tailed)	,006	,006	,001	,622
		N	405	405	405	405
	Frequency of sound of domestic equipment in your house	Correlation Coefficient	,133**	-,101*	-,165**	,113*
		Sig. (2-tailed)	,007	,042	,001	,023
		N	405	405	405	405
	Frequency of sound of talking, shouting in your house	Correlation Coefficient	,265**	-,122*	-,064	-,020
		Sig. (2-tailed)	,000	,014	,198	,691
		N	405	405	405	405
	Frequency of sound of movement in your house (walking, furniture, doors)	Correlation Coefficient	,177**	-,168**	-,174**	,068
		Sig. (2-tailed)	,000	,001	,000	,172
		N	405	405	405	405
	Frequency of sound of neighbours talking, shouting	Correlation Coefficient	,177**	-,139**	-,054	-,029
		Sig. (2-tailed)	,000	,005	,277	,556
		N	405	405	405	405
	Frequency of sound neighbours' domestic equipment	Correlation Coefficient	,099*	-,071	,004	,019
		Sig. (2-tailed)	,048	,154	,942	,703
		N	405	405	405	405
	Frequency of sound of neighbours' movement (walking, furniture, doors)	Correlation Coefficient	,149**	-,104*	-,072	,007
		Sig. (2-tailed)	,003	,037	,146	,883
		N	405	405	405	405
	Frequency of sound of drainage systems/ water pipes	Correlation Coefficient	,155**	,015	-,084	,064
		Sig. (2-tailed)	,002	,764	,091	,201
		N	405	405	405	405
	Frequency of sound of rain	Correlation Coefficient	,074	-,078	,025	-,039
		Sig. (2-tailed)	,138	,117	,621	,436
		N	405	405	405	405
	Frequency of sound of wind	Correlation Coefficient	,056	-,079	,037	-,029
		Sig. (2-tailed)	,263	,112	,461	,560
		N	405	405	405	405
	Frequency of sound of domesticated animals (cats, dogs, birds, etc.)	Correlation Coefficient	,020	-,060	-,020	-,090
		Sig. (2-tailed)	,685	,226	,692	,071
		N	405	405	405	405
	Frequency of sound of street animals (dogs, cats)	Correlation Coefficient	,095	-,140**	-,021	-,006
		Sig. (2-tailed)	,057	,005	,680	,907
		N	405	405	405	405
	Frequency of sound of urban birds	Correlation Coefficient	,147**	-,146**	-,058	,018
		Sig. (2-tailed)	,003	,003	,242	,723
		N	405	405	405	405

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

Correlation between the sound source favourability and demographics:

Correlations

			Gender	Age Category	Occupation	Education Level
Spearman's rho	Favourability of sound of planes, jets, and helicopters that are passing by	Correlation Coefficient	,105*	,065	-,053	,192**
		Sig. (2-tailed)	,034	,193	,284	,000
		N	405	405	405	405
	Favourability of sound of trains or subway trains that are passing by	Correlation Coefficient	-,015	,073	-,171**	,239**
		Sig. (2-tailed)	,759	,142	,001	,000
		N	405	405	405	405
	Favourability of sound of motorcycles, cars, buses, and trucks that are passing by	Correlation Coefficient	-,047	,046	-,082	,213**
		Sig. (2-tailed)	,343	,359	,098	,000
		N	405	405	405	405
	Favourability of sound of horns from vehicle	Correlation Coefficient	-,132**	,062	-,076	,237**
		Sig. (2-tailed)	,008	,210	,126	,000
		N	405	405	405	405
	Favourability of sound of police/ambulance sirens	Correlation Coefficient	,020	,014	-,070	,240**
		Sig. (2-tailed)	,691	,779	,157	,000
		N	405	405	405	405
	Favourability of sound of nearby schools (children shouting, bells, etc.)	Correlation Coefficient	-,038	-,025	-,099*	,124*
		Sig. (2-tailed)	,452	,617	,047	,012
		N	405	405	405	405
	Favourability of sound religious sounds (azan, church bell, etc.)	Correlation Coefficient	,150**	-,109*	,182**	-,207**
		Sig. (2-tailed)	,002	,028	,000	,000
		N	405	405	405	405
	Favourability of sound of shutters of shops / markets	Correlation Coefficient	-,161**	,130**	-,079	,224**
		Sig. (2-tailed)	,001	,009	,112	,000
		N	405	405	405	405
	Favourability of sound of nearby Construction	Correlation Coefficient	-,089	-,007	-,108*	,267**
		Sig. (2-tailed)	,074	,893	,029	,000
		N	405	405	405	405
	Favourability of sound of people on the street (talking, walking, etc.)	Correlation Coefficient	-,164**	,054	-,067	,224**
		Sig. (2-tailed)	,001	,279	,178	,000
		N	405	405	405	405
	Favourability of sound of domestic equipment in your house	Correlation Coefficient	-,142**	-,010	-,090	,167**
		Sig. (2-tailed)	,004	,841	,072	,001
		N	405	405	405	405
	Favourability of sound of talking, shouting in your house	Correlation Coefficient	-,204**	-,015	-,074	,171**
		Sig. (2-tailed)	,000	,760	,139	,001
		N	405	405	405	405
	Favourability of sound of movement in your house (walking, furniture, doors)	Correlation Coefficient	-,114*	-,042	-,044	,148**
		Sig. (2-tailed)	,021	,395	,376	,003
		N	405	405	405	405
	Favourability of sound of neighbours talking, shouting	Correlation Coefficient	-,116*	-,012	-,018	,149**
		Sig. (2-tailed)	,020	,811	,713	,003
		N	405	405	405	405
	Favourability of sound neighbours' domestic equipment	Correlation Coefficient	-,143**	-,032	-,077	,174**
		Sig. (2-tailed)	,004	,525	,122	,000
		N	405	405	405	405
	Favourability of sound of neighbours' movement (walking, furniture, doors)	Correlation Coefficient	-,140**	,036	-,063	,207**
		Sig. (2-tailed)	,005	,469	,209	,000
		N	405	405	405	405
	Favourability of sound of drainage systems/ water pipes	Correlation Coefficient	-,041	,002	-,136**	,189**
		Sig. (2-tailed)	,408	,963	,006	,000
		N	405	405	405	405
	Favourability of sound of rain	Correlation Coefficient	-,017	,062	,202**	-,151**
		Sig. (2-tailed)	,738	,214	,000	,002
		N	405	405	405	405
	Favourability of sound of wind	Correlation Coefficient	-,034	,051	,019	,110*
		Sig. (2-tailed)	,492	,307	,709	,026
		N	405	405	405	405
	Favourability of sound of domesticated animals (cats, dogs, birds, etc.)	Correlation Coefficient	-,019	,037	-,133**	,192**
		Sig. (2-tailed)	,698	,456	,008	,000
		N	405	405	405	405
	Favourability of sound of street animals (dogs, cats)	Correlation Coefficient	-,047	-,001	-,151**	,217**
		Sig. (2-tailed)	,346	,976	,002	,000
		N	405	405	405	405
	Favourability of sound of urban birds	Correlation Coefficient	-,008	-,028	,077	-,123*
		Sig. (2-tailed)	,869	,575	,122	,013
		N	405	405	405	405

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

APPENDIX D:

Correlations between Soundscape Perception and Residential Environment Factors

Correlation between importance of the sound environment and residential environment:

Correlations

			Importance of Sound Environment	Period of living in the current house	House Type	Location of the apartment within the building	Number of intermediate floor	Living area in Ankara
Spearman's rho	Importance of Sound Environment	Correlation Coefficient	1,000	,041	-,047	-,025	-,007	-,072
		Sig. (2-tailed)	.	,413	,341	,614	,882	,148
		N	405	405	405	405	405	405
	Period of living in the current house	Correlation Coefficient	,041	1,000	-,022	,050	-,010	,134**
		Sig. (2-tailed)	,413	.	,663	,313	,835	,007
		N	405	405	405	405	405	405
	House Type	Correlation Coefficient	-,047	-,022	1,000	,364**	,250**	,015
		Sig. (2-tailed)	,341	,663	.	,000	,000	,763
		N	405	405	405	405	405	405
	Location of the apartment within the building	Correlation Coefficient	-,025	,050	,364**	1,000	,457**	,049
		Sig. (2-tailed)	,614	,313	,000	.	,000	,328
		N	405	405	405	405	405	405
	Number of intermediate floor	Correlation Coefficient	-,007	-,010	,250**	,457**	1,000	,132**
		Sig. (2-tailed)	,882	,835	,000	,000	.	,008
		N	405	405	405	405	405	405
	Living area in Ankara	Correlation Coefficient	-,072	,134**	,015	,049	,132**	1,000
		Sig. (2-tailed)	,148	,007	,763	,328	,008	.
		N	405	405	405	405	405	405

**. Correlation is significant at the 0.01 level (2-tailed).

Correlation between the overall satisfaction from the sound environment and the changes in the residential environment:

Correlations

			Satisfaction from sound environment	Period of living in the current house	House Type	Location of the apartment within the building	Number of intermediate floor	Living area in Ankara
Spearman's rho	Satisfaction from sound environment	Correlation Coefficient	1,000	-,082	-,032	-,028	-,057	-,123*
		Sig. (2-tailed)	.	,100	,525	,568	,251	,013
		N	405	405	405	405	405	405
	Period of living in the current house	Correlation Coefficient	-,082	1,000	-,022	,050	-,010	,134**
		Sig. (2-tailed)	,100	.	,663	,313	,835	,007
		N	405	405	405	405	405	405
	House Type	Correlation Coefficient	-,032	-,022	1,000	,364**	,250**	,015
		Sig. (2-tailed)	,525	,663	.	,000	,000	,763
		N	405	405	405	405	405	405
	Location of the apartment within the building	Correlation Coefficient	-,028	,050	,364**	1,000	,457**	,049
		Sig. (2-tailed)	,568	,313	,000	.	,000	,328
		N	405	405	405	405	405	405
	Number of intermediate floor	Correlation Coefficient	-,057	-,010	,250**	,457**	1,000	,132**
		Sig. (2-tailed)	,251	,835	,000	,000	.	,008
		N	405	405	405	405	405	405
	Living area in Ankara	Correlation Coefficient	-,123*	,134**	,015	,049	,132**	1,000
		Sig. (2-tailed)	,013	,007	,763	,328	,008	.
		N	405	405	405	405	405	405

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

Correlation between the overall soundscape perception and the residential environment changes:

Correlations

			Period of living in the current house	House Type	Location of the apartment within the building	Number of intermediate floor	Living area in Ankara
Spearman's rho	Quietness	Correlation Coefficient	,068	,055	,068	,080	,063
		Sig. (2-tailed)	,170	,267	,170	,107	,205
		N	405	405	405	405	405
	Goodness	Correlation Coefficient	,006	,021	,019	,033	,099*
		Sig. (2-tailed)	,905	,673	,698	,510	,047
		N	405	405	405	405	405
	Pleasantness	Correlation Coefficient	-,023	,094	,064	,051	,034
		Sig. (2-tailed)	,649	,060	,197	,306	,500
		N	405	405	405	405	405
	Peacefulness	Correlation Coefficient	-,005	,073	-,004	,069	,069
		Sig. (2-tailed)	,920	,144	,929	,164	,168
		N	405	405	405	405	405
	Comfort	Correlation Coefficient	-,068	,036	,004	,069	,111*
		Sig. (2-tailed)	,173	,465	,938	,166	,026
		N	405	405	405	405	405
	Positivity	Correlation Coefficient	-,027	,046	,030	,086	,099*
		Sig. (2-tailed)	,582	,357	,545	,084	,047
		N	405	405	405	405	405
	Favourability	Correlation Coefficient	-,033	,093	,002	,070	,099*
		Sig. (2-tailed)	,507	,061	,975	,157	,046
		N	405	405	405	405	405
	Calmness	Correlation Coefficient	,008	,063	,028	,055	,064
		Sig. (2-tailed)	,870	,207	,576	,267	,197
		N	405	405	405	405	405

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Correlation between the perception of the sound source loudness and residential environment changes:

Correlations

		Period of living in the current house	House Type	Location of the apartment within the building	Number of intermediate floor	Living area in Ankara
Spearman's rho	Sound level of planes, jets, and helicopters that are passing by	Correlation Coefficient	,188**	,014	,196**	,107*	,046
		Sig. (2-tailed)	,000	,785	,000	,031	,356
		N	405	405	405	405	405
	Sound level of trains or subway trains that are passing by	Correlation Coefficient	,049	-,011	,063	-,016	,009
		Sig. (2-tailed)	,323	,821	,204	,745	,864
		N	405	405	405	405	405
	Sound level of motorcycles, cars, buses, and trucks that are passing by	Correlation Coefficient	,032	,028	,053	,006	-,045
		Sig. (2-tailed)	,515	,580	,289	,908	,370
		N	405	405	405	405	405
	Sound level of horns from vehicle	Correlation Coefficient	,068	,028	,086	,039	,005
		Sig. (2-tailed)	,169	,578	,086	,437	,915
		N	405	405	405	405	405
	Sound level of police/ambulance sirens	Correlation Coefficient	,062	,004	,076	,056	,037
		Sig. (2-tailed)	,214	,939	,125	,260	,459
		N	405	405	405	405	405
	Sound level of nearby schools (children shouting, bells, etc.)	Correlation Coefficient	,149**	-,018	-,005	,014	,082
		Sig. (2-tailed)	,003	,717	,926	,783	,099
		N	405	405	405	405	405
	Sound level of religious sounds (azan, church bell, etc.)	Correlation Coefficient	,040	,058	,033	,001	,035
		Sig. (2-tailed)	,420	,245	,508	,977	,482
		N	405	405	405	405	405
	Sound level of shutters of shops / markets	Correlation Coefficient	,043	,029	,018	,074	,123*
		Sig. (2-tailed)	,390	,559	,718	,140	,013
		N	405	405	405	405	405
	Sound level of nearby Construction	Correlation Coefficient	,046	-,025	-,011	,041	,043
		Sig. (2-tailed)	,353	,617	,829	,415	,385
		N	405	405	405	405	405
	Sound level of people on the street (talking, walking, etc.)	Correlation Coefficient	,028	-,003	-,036	-,066	,003
		Sig. (2-tailed)	,581	,955	,473	,187	,949
		N	405	405	405	405	405
	Sound level of domestic equipment in your house	Correlation Coefficient	-,058	,060	-,085	-,087	-,004
		Sig. (2-tailed)	,245	,231	,088	,080	,930
		N	405	405	405	405	405
	Sound level of talking, shouting in your house	Correlation Coefficient	-,010	,088	-,054	,004	,009
		Sig. (2-tailed)	,843	,079	,279	,932	,855
		N	405	405	405	405	405
	Sound level of movement in your house (walking, furniture, doors)	Correlation Coefficient	-,038	,078	-,037	-,077	,041
		Sig. (2-tailed)	,440	,115	,454	,120	,410
		N	405	405	405	405	405
	Sound level of neighbours talking, shouting	Correlation Coefficient	,093	,163**	,061	-,013	,059
		Sig. (2-tailed)	,062	,001	,220	,801	,239
		N	405	405	405	405	405
	Sound level of neighbours' domestic equipment	Correlation Coefficient	,037	,071	-,042	-,066	,011
		Sig. (2-tailed)	,458	,155	,395	,186	,831
		N	405	405	405	405	405
	Sound level of neighbours' movement (walking, furniture, doors)	Correlation Coefficient	-,051	,087	-,120*	-,080	-,005
		Sig. (2-tailed)	,309	,079	,015	,110	,927
		N	405	405	405	405	405
	Sound level of drainage systems/ water pipes	Correlation Coefficient	-,010	,065	-,132**	-,082	,005
		Sig. (2-tailed)	,837	,193	,008	,099	,923
		N	405	405	405	405	405
	Sound level of rain	Correlation Coefficient	,109*	-,039	,022	-,112*	,002
		Sig. (2-tailed)	,028	,439	,665	,024	,971
		N	405	405	405	405	405
	Sound level of wind	Correlation Coefficient	,121*	-,063	,113*	-,008	-,034
		Sig. (2-tailed)	,015	,203	,023	,866	,491
		N	405	405	405	405	405
	Sound level of domesticated animals (cats, dogs, birds, etc.)	Correlation Coefficient	,177**	-,045	,008	-,088	-,014
		Sig. (2-tailed)	,000	,371	,865	,076	,780
		N	405	405	405	405	405
	Sound level of street animals (dogs, cats)	Correlation Coefficient	,152**	-,025	,000	-,081	-,041
		Sig. (2-tailed)	,002	,617	,992	,102	,408
		N	405	405	405	405	405
	Sound level of urban birds	Correlation Coefficient	,215**	-,044	,092	-,079	,026
		Sig. (2-tailed)	,000	,374	,065	,111	,602
		N	405	405	405	405	405

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

Correlation between the perception of the sound source frequency of occurrence and residential environment changes:

Correlations

			Period of living in the current house	House Type	Location of the apartment within the building	Number of intermediate floor	Living area in Ankara
Spearman's rho	Frequency of sound of planes, jets, and helicopters that are passing by	Correlation Coefficient	,133**	,031	,178**	,099*	,055
		Sig. (2-tailed)	,007	,532	,000	,046	,272
		N	405	405	405	405	405
	Frequency of sound of trains or subway trains that are passing by	Correlation Coefficient	,062	-,069	,004	,031	,166**
		Sig. (2-tailed)	,215	,163	,928	,537	,001
		N	405	405	405	405	405
	Frequency of sound of motorcycles, cars, buses, and trucks that are passing by	Correlation Coefficient	,020	,049	,069	,008	,010
		Sig. (2-tailed)	,694	,326	,166	,878	,835
		N	405	405	405	405	405
	Frequency of sound of horns from vehicle	Correlation Coefficient	,041	,025	,046	,054	,029
		Sig. (2-tailed)	,414	,616	,356	,281	,555
		N	405	405	405	405	405
	Frequency of sound of police/ambulance sirens	Correlation Coefficient	,069	,088	,093	,089	,084
		Sig. (2-tailed)	,168	,076	,062	,072	,091
		N	405	405	405	405	405
	Frequency of sound of nearby schools (children shouting, bells, etc.)	Correlation Coefficient	,130**	-,027	-,062	-,056	,123*
		Sig. (2-tailed)	,009	,590	,215	,263	,013
		N	405	405	405	405	405
	Frequency of sound religious sounds (azan, church bell, etc.)	Correlation Coefficient	-,075	-,023	-,023	-,026	,001
		Sig. (2-tailed)	,133	,648	,640	,608	,981
		N	405	405	405	405	405
	Frequency of sound of shutters of shops / markets	Correlation Coefficient	,017	-,057	-,086	,006	,100*
		Sig. (2-tailed)	,734	,256	,085	,903	,045
		N	405	405	405	405	405
	Frequency of sound of nearby Construction	Correlation Coefficient	-,019	-,050	-,033	,066	,101*
		Sig. (2-tailed)	,697	,312	,513	,185	,042
		N	405	405	405	405	405
	Frequency of sound of people on the street (talking, walking, etc.)	Correlation Coefficient	,027	-,035	-,049	-,044	,055
		Sig. (2-tailed)	,589	,487	,322	,381	,269
		N	405	405	405	405	405
	Frequency of sound of domestic equipment in your house	Correlation Coefficient	-,018	,036	-,112*	-,089	,045
		Sig. (2-tailed)	,714	,472	,024	,075	,370
		N	405	405	405	405	405
	Frequency of sound of talking, shouting in your house	Correlation Coefficient	,072	,054	-,077	-,065	,098*
		Sig. (2-tailed)	,149	,277	,120	,192	,049
		N	405	405	405	405	405
	Frequency of sound of movement in your house (walking, furniture, doors)	Correlation Coefficient	,065	,037	-,055	-,057	,108*
		Sig. (2-tailed)	,195	,452	,271	,252	,030
		N	405	405	405	405	405
	Frequency of sound of neighbours talking, shouting	Correlation Coefficient	,021	,120*	,047	,042	,115*
		Sig. (2-tailed)	,675	,016	,350	,397	,020
		N	405	405	405	405	405
	Frequency of sound neighbours' domestic equipment	Correlation Coefficient	,025	,057	-,056	-,039	,009
		Sig. (2-tailed)	,616	,255	,258	,432	,850
		N	405	405	405	405	405
	Frequency of sound of neighbours' movement (walking, furniture, doors)	Correlation Coefficient	,020	,151**	-,079	-,011	,025
		Sig. (2-tailed)	,685	,002	,113	,824	,619
		N	405	405	405	405	405
	Frequency of sound of drainage systems/ water pipes	Correlation Coefficient	-,059	,067	-,145**	-,115*	,041
		Sig. (2-tailed)	,237	,180	,003	,021	,413
		N	405	405	405	405	405
	Frequency of sound of rain	Correlation Coefficient	,093	-,012	,036	-,149**	-,033
		Sig. (2-tailed)	,060	,809	,472	,003	,507
		N	405	405	405	405	405
	Frequency of sound of wind	Correlation Coefficient	,102*	,081	,124*	-,047	-,063
		Sig. (2-tailed)	,039	,103	,012	,345	,203
		N	405	405	405	405	405
	Frequency of sound of domesticated animals (cats, dogs, birds, etc.)	Correlation Coefficient	,163**	,000	,019	-,051	,030
		Sig. (2-tailed)	,001	1,000	,696	,307	,541
		N	405	405	405	405	405
	Frequency of sound of street animals (dogs, cats)	Correlation Coefficient	,108*	,005	,046	-,063	-,023
		Sig. (2-tailed)	,030	,924	,361	,208	,643
		N	405	405	405	405	405
	Frequency of sound of urban birds	Correlation Coefficient	,124*	-,044	,075	-,077	-,014
		Sig. (2-tailed)	,012	,379	,132	,121	,772
		N	405	405	405	405	405

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

Correlation between the sound source favourability and residential environment changes:

Correlations

			Period of living in the current house	House Type	Location of the apartment within the building	Number of intermediate floor	Living area in Ankara
Spearman's rho	Favourability of sound of planes, jets, and helicopters that are passing by	Correlation Coefficient	-,042	-,032	-,083	-,055	,090
		Sig. (2-tailed)	,403	,519	,095	,266	,070
		N	405	405	405	405	405
	Favourability of sound of trains or subway trains that are passing by	Correlation Coefficient	-,137**	,031	-,066	-,002	,047
		Sig. (2-tailed)	,006	,540	,186	,964	,343
		N	405	405	405	405	405
	Favourability of sound of motorcycles, cars, buses, and trucks that are passing by	Correlation Coefficient	-,033	,029	-,044	,003	-,044
		Sig. (2-tailed)	,503	,558	,372	,945	,376
		N	405	405	405	405	405
	Favourability of sound of horns from vehicle	Correlation Coefficient	-,053	,046	-,015	-,002	-,093
		Sig. (2-tailed)	,288	,357	,759	,966	,060
		N	405	405	405	405	405
	Favourability of sound of police/ambulance sirens	Correlation Coefficient	-,020	-,012	-,023	,002	-,090
		Sig. (2-tailed)	,693	,817	,650	,964	,071
		N	405	405	405	405	405
	Favourability of sound of nearby schools (children shouting, bells, etc.)	Correlation Coefficient	,021	-,064	-,074	,005	-,016
		Sig. (2-tailed)	,667	,197	,139	,926	,743
		N	405	405	405	405	405
	Favourability of sound religious sounds (azan, church bell, etc.)	Correlation Coefficient	,267**	-,030	,069	,134**	,141**
		Sig. (2-tailed)	,000	,547	,165	,007	,004
		N	405	405	405	405	405
	Favourability of sound of shutters of shops / markets	Correlation Coefficient	-,067	,030	,011	,026	-,081
		Sig. (2-tailed)	,179	,551	,822	,595	,103
		N	405	405	405	405	405
	Favourability of sound of nearby Construction	Correlation Coefficient	-,046	,010	,075	,060	-,090
		Sig. (2-tailed)	,352	,838	,132	,228	,070
		N	405	405	405	405	405
	Favourability of sound of people on the street (talking, walking, etc.)	Correlation Coefficient	,008	,011	,035	,049	-,052
		Sig. (2-tailed)	,873	,828	,488	,328	,295
		N	405	405	405	405	405
	Favourability of sound of domestic equipment in your house	Correlation Coefficient	-,029	,049	-,003	,012	-,040
		Sig. (2-tailed)	,561	,322	,953	,817	,423
		N	405	405	405	405	405
	Favourability of sound of talking, shouting in your house	Correlation Coefficient	-,006	,005	,068	,043	-,160**
		Sig. (2-tailed)	,898	,923	,172	,385	,001
		N	405	405	405	405	405
	Favourability of sound of movement in your house (walking, furniture, doors)	Correlation Coefficient	-,044	-,038	,053	,006	-,103*
		Sig. (2-tailed)	,378	,447	,288	,905	,038
		N	405	405	405	405	405
	Favourability of sound of neighbours talking, shouting	Correlation Coefficient	-,040	,026	,072	,023	-,078
		Sig. (2-tailed)	,421	,605	,150	,640	,117
		N	405	405	405	405	405
	Favourability of sound neighbours' domestic equipment	Correlation Coefficient	-,037	-,002	-,003	-,024	-,122*
		Sig. (2-tailed)	,456	,974	,956	,628	,014
		N	405	405	405	405	405
	Favourability of sound of neighbours' movement (walking, furniture, doors)	Correlation Coefficient	-,031	,038	-,032	-,004	-,113*
		Sig. (2-tailed)	,530	,445	,525	,936	,023
		N	405	405	405	405	405
	Favourability of sound of drainage systems/ water pipes	Correlation Coefficient	-,112*	,012	-,001	-,013	-,071
		Sig. (2-tailed)	,025	,803	,992	,798	,154
		N	405	405	405	405	405
	Favourability of sound of rain	Correlation Coefficient	,195**	,042	,042	,063	,076
		Sig. (2-tailed)	,000	,394	,400	,209	,128
		N	405	405	405	405	405
	Favourability of sound of wind	Correlation Coefficient	,063	,008	,003	,020	-,003
		Sig. (2-tailed)	,207	,874	,952	,689	,948
		N	405	405	405	405	405
	Favourability of sound of domesticated animals (cats, dogs, birds, etc.)	Correlation Coefficient	-,067	-,019	-,105*	-,046	-,055
		Sig. (2-tailed)	,179	,706	,034	,354	,272
		N	405	405	405	405	405
	Favourability of sound of street animals (dogs, cats)	Correlation Coefficient	-,107*	-,075	-,111*	-,037	-,035
		Sig. (2-tailed)	,032	,130	,026	,454	,478
		N	405	405	405	405	405
	Favourability of sound of urban birds	Correlation Coefficient	,143**	-,062	,035	,112*	,110*
		Sig. (2-tailed)	,004	,211	,486	,025	,027
		N	405	405	405	405	405

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).