




## Article

# The Restorativeness of Outdoor Historical Sites in Urban Areas: Physical and Perceptual Correlations

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**Abstract:** Growing tourist flows, which crowd ancient city centres, have modified their liveability and threatened conservation. They have increased the need for quiet places, primarily where green parks are missing. While previous studies have highlighted the possibility of reusing hidden sites of historical buildings, it is not clear if this scheme can also be applied in other contexts, and which physical or perceptual dimensions are mainly related to the restoration of these sites. If greenery and water elements induce positive effects on people’s well-being, we want to understand if the historical–artistic component can be just as important for people’s restorativeness. To this end, the physical and perceptual characteristics of 20 different sites in Naples and Istanbul were investigated through objective and subjective surveys. The results show that the sound levels inside sites cannot consistently account for the perception of the restorativeness in Italy and Turkey, while some sound level differences caused by outside noise could. Moreover, soundscape, appreciation, maintenance/management, and importance/relevance were the main perceptual dimensions describing these places. The importance/relevance dimension was strongly correlated with all the components of the restorativeness, especially with the fascination. These findings are consistent between the Italian and Turkish groups.

**Keywords:** quiet areas; historical centres; restorativeness; courtyards; noise



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## 1. Introduction

In recent decades, the European Environmental Agency (EEA) has devoted great attention to noise pollution in heavily populated cities and to urban planning policies adopted to preserve areas of good acoustic and environmental quality. This estimated that, in the EU, 81.7 million people are exposed to  $L_{den} \geq 55$  dB and 57.5 million are exposed to  $L_{night} \geq 50$  dB [1] road traffic noise. The Environmental Noise Directive (END) recognises the need to preserve quiet areas, as zones with low sound levels can provide relief from environmental stress and opportunities to rest and relax for individuals. Natural environments are among the best candidates for this role, as the relationship between health and exposure to the natural environment is widely documented. Natural environments reduce mortality caused by cardiovascular diseases and respiratory illness, and improve self-reported well-being and cognitive ability.

Health restoration is strictly related to some environmental characteristics [2]. Trees, green plants, flowers [3,4] and water elements (e.g., basins, fountains, streams, and waterfalls) [5–7] are important landscape elements for human-perceived well-being and offer relief from stressful city life.

Most of the previous studies [8–11] use Kaplan’s Attention Restoration Theory (ART) [12] and the Perceived Restorativeness Scale, proposed by Hartig [13], or its variations [14–16]

to investigate the restorative values of spaces. According to ART [12], four main components of the environment contribute to restoration. These components are Being Away, Extent (which was subsequently divided into Coherence and Scope [15]), Fascination, and Compatibility. It means that an environment is restorative if it is different from the usual, it is perceived, on the whole, as a place to spend time, it is interesting and fascinating, and it is compatible with people's expectations. Attention Restoration Theory was conceived to investigate natural and green spaces, but it can also be used in other contexts. Payne has investigated the restorativeness that auditory experience may provide to individuals [16,17]. In her studies, besides developing a specific scale—the perceived restorativeness soundscape scale (PRSS) [16]—she found out that the same four ART components are important to ensure that soundscapes are designed to create a potentially restorative environment [17].

Different countries, cities and regions defined and identified the criteria for quiet areas and revisited the concept of quietness [18]. Finding such areas, usually green parks in urban agglomerations, or finding space to build new areas, is often difficult, especially in dense cities. Additionally, urban parks are not always easily accessible to citizens and visitors. Accessibility depends on different factors, such as the distance, the travel modes, the available time, and the population characteristics [19]; thus, smaller public green areas may respond to the citizens' need for green areas. National recommendations about the quantity of green space per habitant in Turkey and Italy set a minimum of 7.5 and 9 square meters per person, respectively. These surfaces are insufficient if we consider densely urbanised and populated cities, where the needs of psychophysical restoration and the well-being of the residents must be shared with large tourist flows. From this perspective, quiet places may enhance the restorativeness and recreation of people in urban environments, positively affecting the quality of life in the city [20]. According to Gidlöf-Gunnarsson and Ohrströmin [21], as quiet places become more accessible, the adverse effects of traffic noise are reduced.

Nevertheless, quietness is not the only criterion for creating a good built environment. It is important to create high-quality quiet courtyards that can provide urban residents with a positively perceived sound environment and an attractive visual appearance, allowing them to rest and engage in social contact opportunities. Due to the numerous historical city centres facing a lack of urban green spaces, a growing need to optimise the use of available spaces has emerged [22].

For this reason, the interest of researchers has turned toward the use of existing spaces, and the beneficial effect that historical and cultural elements may have on individuals. The restorative potential of cultural landmarks has been explored by several researchers [21,23–27], showing that engagement with the arts and culture improves well-being and life satisfaction [23,24], and that historical and cultural places are valued as the most restorative places in cities [25]. The study by Scopelliti et al. [26] in Rome, which involved 125 participants, and the systematic review of Weber and Tojan [27], have shown that both historical and natural environments have restorative value. Fornara and Troffa [28] compared four public spaces in the city of Cagliari (an urban park, a shopping mall, a historic plaza, and a panoramic promenade), and found that the historical sites were perceived as restorative and as the most pleasant and relaxing places. The restorative potential of artistic elements was also explored by Kaplan et al. [29–31], using 23 items related to restoration that satisfied the four components of ART (Being Away, Extent, Fascination and Compatibility). The survey was administered to a sample of 124 visitors of the Toledo Museum of Art and aimed to investigate whether art museums can offer a restorative experience and permit visitors to recover their cognitive and emotional effectiveness. The survey considered both adverse reactions of participants, such as Museum fatigue (a state of physical or mental tiredness), feelings of worry or outside concerns, and both their restorative feelings. In general, the visitors reported that they had a restorative experience with higher scores for visits to the museum lasting three hours or more. The visitors

who felt confused and uncomfortable with museum settings were had a less restorative experience. These results emphasise the importance of compatibility components.

Moreover, Xu et al. [32] carried out a study involving 459 participants to investigate the restorative potential of the cultural landscape, compared to the natural one, and the main attributes that influence the restoration of a place. The results proved that the cultural landscape positively influences mental restoration, as well as the natural landscape. Moreover, the findings showed that water features might improve the cultural landscape's mental restoration, while rich colours are essential to the promotion of the restorative potential of natural settings. Therefore, a combination of natural and cultural elements is desirable to increase the restorative capacity of a place.

This paper explores the physical and perceptual characteristics of 20 historical sites located inside the old city centre of Naples, in Italy [33–36], and in the historical Peninsula of Istanbul, in Turkey [37], by analysing the correlations existing among them, identifying the main perceptual dimensions describing these places, and highlighting the resultant differences between the two regions. Great attention has been paid to investigate the importance of the cultural aspects on the restorative potentials.

## 2. Methodology

### 2.1. Material and Methods

An objective and subjective survey exploring the physical characteristics and perceptual attributes of the sites was carried out at different cloisters and building courts in Italy, and Khan and Mosque's courtyards in Turkey. Experts conducted an objective survey to investigate the main relevant Qualitative Aspects and the acoustical characteristics of the sites.

A Technical Datasheet was prepared and used to objectively characterise the following main aspects of the sites:

- Importance/Relevance considers the typology of the site (T- Site), the dimensions (D), the existence of protective entrances (PE) and the presence of elements of cultural and historical significance (CV);
- Maintenance and Management considers the cleanliness (CL), the presence of green (GE) and blue elements (BE) and the safety (SAFE);
- Activities includes the site's accessibility (ACC), the activity typologies (T- ACT), and intensity (I).

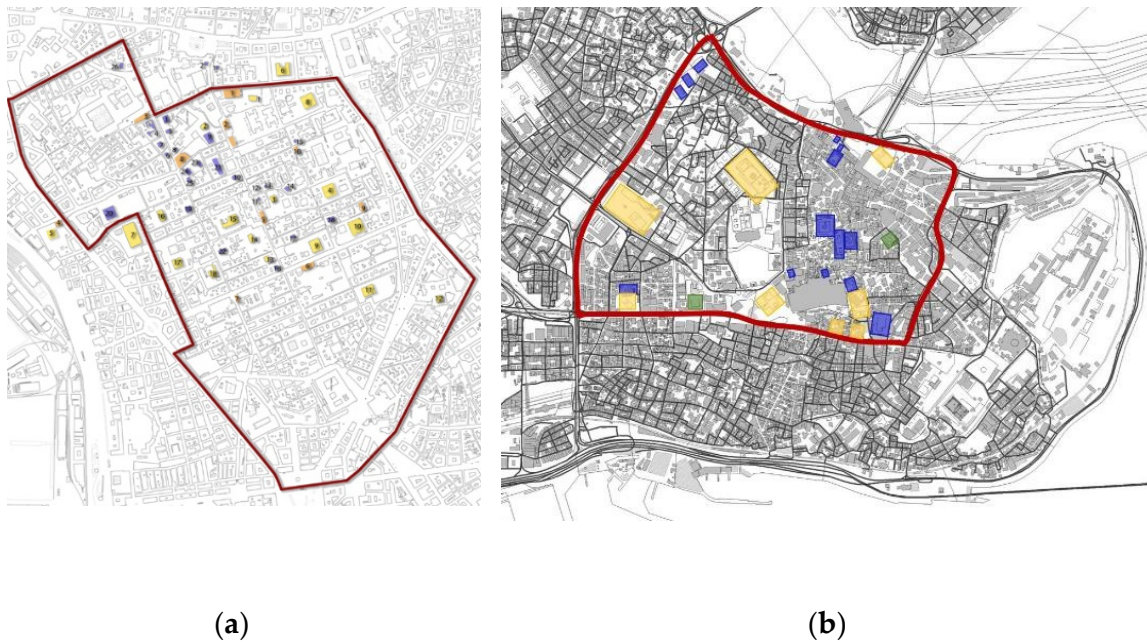
The existing soundscapes were investigated using binaural sound recordings, carried out in two different periods of the day, in the morning and the afternoon. For each of the sites, the inner soundscape was recorded by spot measurements of about 4 min, while the outer soundscape was recorded with four different soundwalks of about 3 min, along two opposite paths (A and B). Each path links the sites to the nearest noisy urban area.

The visitors' perception of the site was investigated using a subjective questionnaire, administered in situ. The questionnaire is structured into five different parts:

1. General Information: a set of questions about the respondents, their characteristics, and their access motivations;
2. Weinstein's Noise Sensitivity Scale (WNSS): measures the individual differences in sensitivity to noise [38–40];
3. Perceived Restorativeness Scale (PRS-11): measures the Restorativeness of sites and its components: Fascination (FAS), Being Away (B-A), Coherence (COH), and Scope (SCO);
4. Qualitative Aspects Questionnaire (QQA): measures how much the historical and cultural aspects influence the participants' experience;
5. Semantic Differential Scale (SDS): dichotomic adjectives to measure the perception concerning the Soundscape, Appreciation, Maintenance/Management, Importance/Relevance, and Activity.

## 2.2. Areas of Study

Due to the similarity of the soundscapes of their urban areas [41], Naples' old city centre and the historical Peninsula of Istanbul have been selected as case studies (Figure 1). Both are important cities of the Mediterranean area, densely populated and rich in history. Both the Neapolitan urban fabric and the Historic Areas of Istanbul preserve their historical stratification. At the same time, uncontrolled urbanisation and the lack of green and urban parks make it necessary to identify new potential quiet areas. In urban areas, outdoor historical sites, such as the cloisters of old monasteries and courts of historical buildings in Naples and Khan and Mosque courtyards in Istanbul, can represent a solution.



**Figure 1.** (a) Outdoor historical sites in the old city centre of Naples and (b) in the Historical Peninsula of Istanbul.

### 2.2.1. Outdoor Historical Sites in Italy

Despite its ancient origin, Naples' old city centre has retained the original Greek layout with its characteristics, *platêiai* and *stenōpói*, surrounded by historic and religious buildings. Along these narrow streets, always crowded and full of sounds generated by numerous crafts and commercial activities, cloisters and courtyards offer shelter from vehicle noise and outside chaos. In the Neapolitan city, it is possible to count numerous historical courtyards and cloisters.

Among them, after a preliminary screening, five cloisters (cloister of San Paolo Maggiore, cloister of Santa Patrizia, cloister of San Domenico Maggiore, cloister of Saints Marcellino e Festo and the cloister of the Academy of Fine Arts) and five courtyards (Courtyard of San Domenico Maggiore, Palazzo Real Monte Manso di Scala, Palazzo Diomede Carafa, Palazzo Venezia, and Palazzo Marigliano) were selected for the study.

#### The Cloisters

The selected cloisters (Figure 2) have an area larger than 1500 m<sup>2</sup>, except for the cloisters of San Paolo Maggiore and San Domenico Maggiore, which have an extension of about 400 m<sup>2</sup>. The cloisters no longer retain their original functions, but they have been assigned new means of use over time. At present, the cloisters of Santa Patrizia, Saints Marcellino e Festo and the Academy of Fine Arts are the headquarters of university departments and museums. The cloister of San Paolo Maggiore hosts the District Notary Archives' offices, while the cloister of San Domenico Maggiore occasionally hosts exhibitions and conferences. Except for the cloister of Fine Arts, the cloisters are enclosed by a paved walkway, and all present a central green area with bushes, flowers, trees, or a beautiful



botanical garden, such as the one located in Saints Marcellino e Festo. As the courtyards' height to width ratio impacts several factors, such as shading, daytime outdoor temperature and daylighting [42], the average value of the two cross-sections was estimated. For the cloisters, this ranges between about 0.4 and 0.7 for the Accademia delle Belle Arti, Santa Patrizia and San Marcellino e Festo, and about 1.2 for San Paolo Maggiore and San Domenico Maggiore. All the cloisters have further shaded areas, created by the presence of the covered walkway and large trees.



**Figure 2.** (a) cloister of San Paolo Maggiore; (b) cloister of Santa Patrizia; (c) cloister of San Domenico Maggiore; (d) cloister of Saints Marcellino e Festo; (e) cloister of Academy of fine Arts.

Moreover, all the cloisters, except for the cloister of San Domenico Maggiore, are enriched by blue elements like a fountain with zoomorphic decoration (cloister of Saint Marcellino e Festo), a central well in white marble (cloister of San Paolo Maggiore) or simple fountains (cloister of Santa Patrizia and Academy of Fine Arts). All the cloisters also present protective entrances, with double doors connected by a gate and enriched by cultural value elements. The cloister of San Domenico Maggiore is adorned by four statues coming from the no-longer-existing church of San Sebastiano; the cloister of Saints Marcellino e Festo and the Academy of Fine Arts host some archaeological finds and works of art. The cloister of San Paolo Maggiore is rich in frescos, unlike the cloister of Santa Patrizia, where the frescoes representing the life of the Saint and of Christ have been whitewashed. Today, only a few traces are visible (Figure 3).

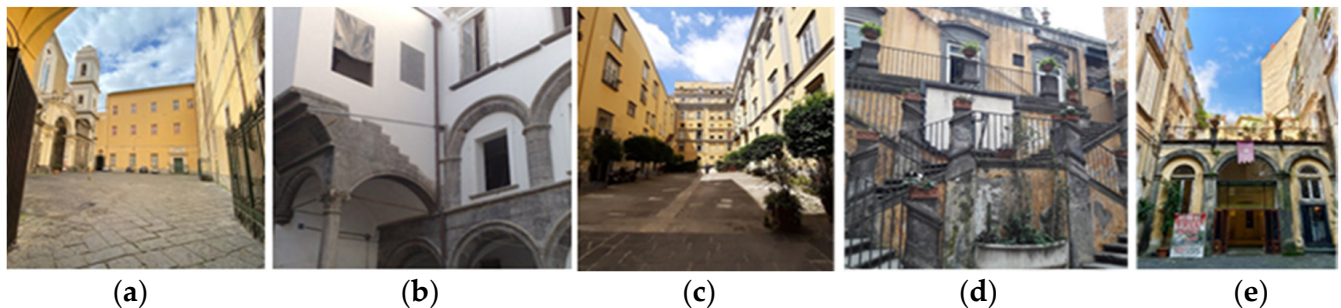


**Figure 3.** Some examples of Elements of Cultural Value, Protective Entrances and Blue Elements.

### The Courtyards

Today, the historical palaces and their related courtyards (Figure 4) are used for occasional cultural events, such as the court of San Domenico Maggiore, or they host artistic workshops and art galleries, such as Palazzo Venezia or Palazzo Real Monte Manso di Scala. Some of them are headquarters of the Archival Superintendency Office (Palazzo Marigliano) or Archival and Bibliographic Surveillance (Palazzo Diomede Carafa). Unlike the cloisters, the extension of each historical courtyard does not exceed 850 m<sup>2</sup>; they are rich in potted plants and well-tended trees such as succulents, cyclamen, jasmine, and olive trees. An exception is Palazzo Venezia, which presents a beautiful eighteenth-century garden full of centuries-old trees, partitioned plants and a Casina Pompeiana with beautiful canvases inside. All have protective entrances and preserve elements of cultural values (Figure 5) like frescoes, statues, including a terracotta copy of a bronze horse's head (Palazzo

Diomede Carafa), and epigraphs. Shaded areas are provided by the courtyards' smaller dimensions and higher buildings, as can be observed by measuring the average height to width ratios of the two cross-sections of the courts, which range between about 0.80 for the court of San Domenico Maggiore and 1.7 for Palazzo Marigliano.



**Figure 4.** (a) Court of San Domenico Maggiore; (b) Palazzo Diomede Carafa; (c) Palazzo Real Monte Manso di Scala; (d) Palazzo Marigliano; (e) Palazzo Venezia.



**Figure 5.** Some examples of cultural elements and protective entrances.

### 2.2.2. Outdoor Historical Sites in Turkey

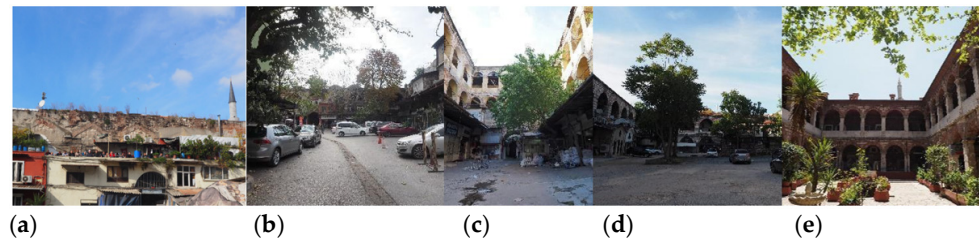
The Historical Peninsula of Istanbul preserves several historic buildings comprising civic, religious, and architectural examples belonging to the Byzantine, Ottoman, and early Republican periods. The touristic part of the Historical Peninsula generally has two different characteristics. The small district of the Peninsula around Sultanahmet Square is well known, including Topkapı Palace, Hagia Sophia, Sultanahmet Mosque, and Yerebatan Cistern. In this district, the environment is mainly an artificial urban space arranged for visitors, with reduced local activity. However, most of the Peninsula is more devoted to everyday urban life. With its bazaar, residential and religious areas, the district is alive within and in urban space. In the Historical Peninsula, it is possible to find numerous historical courtyards in khans and mosques that offered social living space in the past and present. Five khan courtyards (Balkapani Khan, Buyuk Valide Khan, Buyuk Yeni Khan, Vezir Khan and Tas Khan) and five mosque courtyards (Nuruosmaniye Mosque, Corlulu Ali Pasa Mosque, Gazi Atik Ali Mosque, Sehzadebasi Mosque, Süleymaniye Mosque) in Istanbul's commercial and touristic Historical Peninsula were chosen for the study.

#### The Khan Courtyards

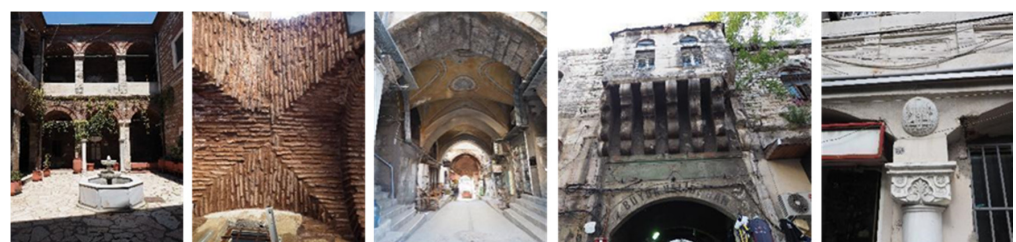
Three of the five selected khans (Figure 6) have an area of more than 500 m<sup>2</sup>, which is not crowded, with retail trade in the courtyard, and are connected to pedestrian areas (Balkapani Khan, Buyuk Valide Khan and Buyuk Yeni Khan); two are directly connected to a road with vehicular traffic (Vezir Khan and Tas Khan). There are business units (primarily wholesalers), catering units, production workshops and warehouses in the courtyards of the khans (except Tas Khan). Perennial trees, small tree saplings, ivy, potted plants, and flowers were planted in the courtyards. Balkapani Khan and Buyuk Valide Khan have a small masjid in the middle of the courtyard. In the courtyard of Tas Khan are clothing shops that serve tourists, various business units, and a restaurant in the basement, accessed from the courtyard. All buildings have protective entrances and elements of cultural values, such as frescoes, decorative pools, column headings, and historical or brick walls bonded



by different bricklaying methods (Figure 7). Except for the Buyuk Yeni Khan, the average height to width ratio of Khans' courtyards ranges between 0.25 and 0.6. The shadowing is limited to the rare presence of single trees.



**Figure 6.** (a) Court of Balkapani Khan; (b) Buyuk Valide Khan; (c) Buyuk Yeni Khan; (e) Vezir Khan; (d) Tas Khan.



**Figure 7.** Some examples of cultural elements and protective entrances.

#### The Mosque Courtyards

The five selected Mosques courtyards have an area of more than 500 m<sup>2</sup> (Figure 8); two of them are connected to pedestrian areas (Corlulu Ali Pasa Mosque, Gazi Atik Ali Mosque), and three are directly connected to a road with vehicular traffic (Nuruosmaniye Mosque, Sehzadebasi Mosque, Suleymaniye Mosque). There are business units and catering units in the courtyards of Gazi Atik Ali Mosque, and carpet stores that serve tourists in the courtyard of Corlulu Ali Pasa Mosque. Additionally, perennial trees and lawns are present in all courtyards. All Mosques have protective entrances and elements of cultural values, like a water-tank with a fountain, historic fountain, historic crown gate or epitaph (Figure 9). The average height to width ratio of the Mosque courtyard is always below 0.25. The shadowing is mainly provided by the presence of trees.



**Figure 8.** (a) Court of Nuruosmaniye Mosque; (b) Corlulu Ali Pasa Mosque; (c) Gazi Atik Ali Mosque; (d) Sehzadebasi Mosque; (e) Suleymaniye Mosque.

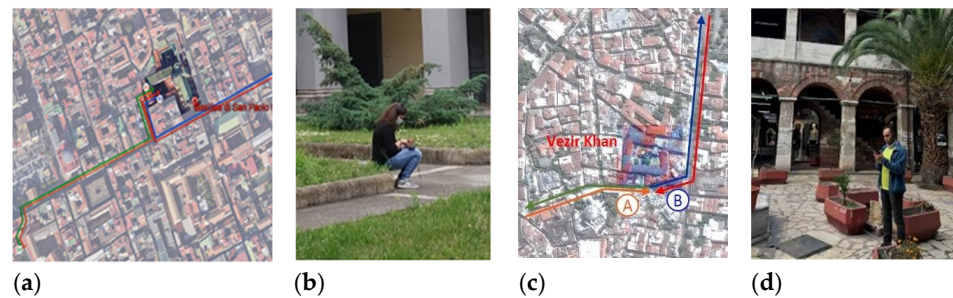


**Figure 9.** Some examples of cultural elements and protective entrances.

### 3. Field Survey

#### 3.1. Soundwalks

In urban acoustics research, sound recordings and measurements are widely used. The soundwalk approach was used for this study to carry out sound recordings. The acoustic measurements were performed twice a day, one in the morning and the other in the afternoon, inside the courtyard (IN) and along the selected paths (PATH A–PATH B) (Figure 10).



**Figure 10.** (a,b) Measurements in Italy; (c,d) Measurements in Turkey.

The binaural recordings were carried out via a binaural BHS II headset connected to a calibrated portable recorder (SQobold Head Acoustics in Italy; B&K Type 2270-S in Turkey). The binaural recording datasets were then analysed with software Artemis Suite and Pulse reflex. Left and right sound equivalent levels, with percentiles 10 and 90 of the binaural recordings, were averaged and associated with each site and path.

#### 3.2. Questionnaires

The five subjective questionnaires were administered at 20 selected sites: 10 in Italy and 10 in Turkey. For each site, a sample of 10 participants was enrolled (Figure 11). The interviewers approached citizens and visitors who seemed to have time to fill in the questionnaire. All participants were informed about the general aspects of the study, its methods, and its institutional affiliations. They were also informed of their right to withdraw consent to participate in the study.



**Figure 11.** (a) In situ questionnaires administered to subjects in Italy (b) and in Turkey.

Moreover, to ensure privacy and anonymity, subjects were asked not to mention their name or other personal information anywhere in the questionnaire. Participants confirmed that they understood the instructions and agreed to participate in the study before filling out the questionnaire.

In the same time range (morning or afternoon), the acoustic measurements were carried out both inside and outside the selected site.

Two hundred subjects, most of them aged between 18 and 60 years (Table 1), were interviewed at different sites in Italy and Turkey. A total 52 Italian and 67 Turkish males, and 48 Italian and 33 Turkish females were interviewed. All the participants gave their



consent before taking part in the study. The Italian participant group comprises tourists and local visitors to cloisters, and employees of commercial activities present within the historical courts and their surroundings. Similarly, the Turkish participant group mainly consists of Khan's employees and tourists in the khans, and local users and tourists in the mosques.

**Table 1.** Number of participants by age groups.

Age (Years)	18–24	25–39	40–60	>60
ITA	19	44	26	11
TUR	11	33	16	29

Eighty-four of the interviewed people lived in the historic centre, 63 in an intermediate area and 34 in the suburban area. Only 15 people lived in a rural area; 14 of them are Italian (Table 2).

**Table 2.** Number of participants by residence area.

Residence Area	Historical Centre	Intermediate Area	Suburban	Rural Area
ITA	35	25	22	14
TUR	49	38	12	1

For the most part, the people who agreed to complete the subjective questionnaire (Table 3) were students (74) or employees (70). The remainder of the participants were self-employed (27), and to a small extent, retirees (13), housewives (9) and unemployed (7).

**Table 3.** Number of participants by employment.

Employment	Student	Housewife	Pensioner	Employee	Self-Employed	Unemployed
ITA	43	8	4	28	11	6
TUR	31	1	9	42	16	1

Most of the subjects work in an indoor environment: 67 subjects have an office job, 38 people are involved in a job without physical effort, while 24 have a job which requires physical effort. Only 14 people declared that they work outdoors: 10 in a job which requires physical effort and 4 in a job which does not. The remaining 31 people stated that their work takes place both inside and outside (Table 4).

**Table 4.** Number of participants by type of work.

Type of Work	Office Work	Work in an Indoor Environment That Does Not Involve Physical Effort	Work in an Indoor Environment That Involves Physical Effort	Outdoor Work That Does Not Involve Physical Effort	Outdoor Work That Involves Physical Effort	Work That Takes Place Both Inside and Outside
ITA	25	19	9	3	1	17
TUR	42	19	15	1	9	14
ITA-TUR	67	38	24	4	10	31

Half of the participants were local inhabitants (57 living inside the area and 43 outside the area), whilst 36 lived in the neighbouring municipality. The remaining participants were tourists (Table 5). Most of the participants stated that they had never visited the site before (69). A large portion declared that they visit the place daily (61). Others visit the place several times a year (32), weekly (21), only in spring or summer (9), or monthly (7) (Table 6).

**Table 5.** Number of participants by provenance.

Provenance	Tourist	Local (I Live in This Area)	Local (I Do Not Live in This Area)	Neighbouring Municipality (Same Province)
ITA	32	28	27	13
TUR	32	29	16	23

**Table 6.** Number of participants by sites' visit frequency.

How Often Do You Come to This Place?	Daily	Weekly	Monthly	Only in Spring/Summer	Several Times a Year	I Have Never Visited This Place
ITA	21	8	3	2	22	44
TUR	40	13	4	7	10	25

The participants' noise sensitivity was also measured using the Weinstein Noise Sensitivity Scale (WNSS) [35–37]. The results indicated that Italian and Turkish participants had similar levels of noise sensitivity, with the Turkish sample having a mean value of 4.19 (median = 4.25; dev.st. = 0.86), slightly higher than 3.57 (median = 3.57; dev.st. = 0.71) of the Italian sample.

Furthermore, respondents were asked to indicate three motivations to access the site. Generally, in both countries, noticeable historical and cultural value elements were considered attractive features for visitors, while less importance was given to natural elements. Most of the respondents entered the site because they were attracted by the historical and cultural aspects (ITA = 39; TUR = 24), or simply because they wanted to visit it (ITA = 30; TUR = 15). Others entered the site because they considered its quietness (ITA = 27; TUR = 5), or because they were looking for shade (ITA = 18; TUR = 1), privacy (ITA = 16; TUR = 8), or a green area (ITA = 13; TUR = 4).

#### 4. Physical and Perceptual Results

##### 4.1. Physical Characteristics and Function of the Sites

From Table 7, it can be observed that, in Italy, all cloisters and courtyards are sites of significant relevance, with protective entrances and elements of cultural value. Moreover, they are well-managed, clean, safe, and rich in green elements. In contrast, the blue elements are present only in the cloisters. Additionally, cloisters and courtyards are all freely accessible to visitors. The courts are typically part of residential buildings and house art galleries, shops, and cafés. In contrast, the cloisters serve as university headquarters and are more frequently visited than courtyards, particularly by students.

**Table 7.** Characterisation of the sites in Italy: Type of the site (T-S): cloister (CLO) or courtyard (CO), dimensions (D), protective entrances (PE), elements of cultural and historical significance (CV), cleanliness (CL), green elements (GE), blue elements (BE), the safety (SAFE), accessibility to the site (ACC), activities typologies (T- ACT), and activity intensity (I) with the number of persons inside (n.pax).

Sites	Importance/Relevance				Maintenance/Management					Activities	
	T-S	D m <sup>2</sup>	PE	CV	CL	GE	BE	SAFE	ACC	T-ACT	I (n.pax)
San Paolo Maggiore	CLO	400	✓	✓	✓	✓	✓	✓	✓	Notarial Archive	0–5
Santa Patrizia	CLO	1560	✓	✓	✓	✓	✓	✓	✓	University, Museum	20–30
San Domenico Maggiore	CLO	403	✓	✓	✓	✓	-	✓	✓	Occasional cultural events	0–5

Table 7. Cont.

Sites	Importance/Relevance				Maintenance/Management					Activities	
	T-S	D	PE	CV	CL	GE	BE	SAFE	ACC	T-ACT	I (n.pax)
		m <sup>2</sup>									
San Marcellino e Festo	CLO	3300	✓	✓	✓	✓	✓	✓	✓	University, Museum	10–60
Accademia delle Belle Arti	CLO	2200	✓	✓	✓	✓	✓	✓	✓	University	20–60
Corte di San Domenico	CO	816	✓	✓	✓	✓	-	✓	✓	Occasional cultural events	0–5
Palazzo R. M. M. di Scala	CO	801	✓	✓	✓	✓	-	✓	✓	Art workshops, Residential building	0–5
Palazzo Diomede Carafa	CO	272	✓	✓	✓	✓	-	✓	✓	Residential Building	0–5
Palazzo Venezia	CO	375	✓	✓	✓	✓	-	✓	✓	Café, Art gallery	<20
Palazzo Marigliano	CO	180	✓	✓	✓	✓	-	✓	✓	Arch. and Bib. Surveillance, Shops	<10

From Table 8, it can be observed that, in Turkey, all courtyards have protective entrances and historical significance. However, mosques are more well-kept, clean, and safe than khans. Moreover, mosques are richer in terms of green and blue elements than khans. While khan courtyards are primarily used for wholesale commercial activities and storage, mosque courtyards are used for religious and cultural activities and relaxation. The courtyards range in size from approximately 500 to 12,000 m<sup>2</sup>. Although the number of users varies according to the time of day, it is lower in khans than in mosques.

**Table 8.** Characterisation of the sites in Turkey: Type of the site (T-S): cloister (CLO) or courtyard (CO), dimensions (D), protective entrances (PE), elements of cultural and historical significance (CV), cleanliness (CL), green elements (GE), blue elements (BE), the safety (SAFE), accessibility to the site (ACC), activities typologies (T- ACT), and activity intensity (I) with the number of persons inside (n.pax).

Sites	Importance/Relevance				Maintenance/Management					Activities	
	T-S	D	PE	CV	CL	GE	BE	SAFE	ACC	T-ACT	I (n.pax)
		m <sup>2</sup>									
Balkapani	KC	1000	✓	✓	-	✓	-	-	✓	Business, Warehouses, Prod. workshops, Small masj.	10–60
Buyuk Valide	KC	3100	✓	✓	-	✓	-	-	✓	Business, Warehouses, Small masj.	<10
Buyuk Yeni	KC	900	✓	✓	-	✓	✓	-	✓	Business un., Warehouses, Prod. Workshops	<10

Table 8. Cont.

Sites	Importance/Relevance				Maintenance/Managment					Activities	
	T-S	D	PE	CV	CL	GE	BE	SAFE	ACC	T-ACT	I (n.pax)
		m <sup>2</sup>									
Veziir	KC	2700	✓	✓	✓	✓	-	-	✓	Business un., Warehouses, Prod. Workshops	<10
Tas	KC	510	✓	✓	✓	✓	✓	✓	✓	Business un., Restaurant	<10
Nuruosmaniye	MC	1800	✓	✓	✓	✓	✓	✓	✓	Religious building	10–60
Corlulu Ali Pasa	MC	600	✓	✓	✓	✓	✓	✓	✓	Religious building	<10
Gazi Atik Ali	MC	1000	✓	✓	✓	✓	✓	✓	✓	Religious building	<10
Sehzadebasi	MC	1000	✓	✓	✓	✓	✓	✓	✓	Religious building	<20
Süleymaniye	MC	12,125	✓	✓	✓	✓	✓	✓	✓	Religious building	20–100

#### 4.2. Acoustic Characterisation of the Sites

The results (Table 9) highlighted that, among paths, in Italy, the A-weighted sound equivalent levels ranged from 66.8 to 75.9 dB(A), with the 90th percentile ranging from 49.0 to 64.6 dB(A) and, in Turkey, from 63.2 to 71.9 dB(A), with the 90th percentile ranging from 60.8 to 64.8 dB(A).

Table 9. Acoustic measurement results.

Site	$\Delta L_{10-90,IN}$	$\Delta L_{90,PATH-IN}$	$\Delta L_{PATH-IN}$	$L_{90,IN}$	$L_{IN}$	$L_{10-IN}$	$L_{90,PATH}$	$L_{PATH}$	$L_{10,PATH}$
	dB	dB	dB	dBA	dBA	dBA	dBA	dBA	dBA
San Paolo Maggiore	11.0	16.7	21.1	41.9	48.9	52.9	58.6	70.0	73.7
Santa Patrizia	16.6	5.2	13.6	49.6	58.6	66.2	54.8	72.2	76.1
San Domenico Maggiore	9.4	10.7	25.2	38.3	43.3	47.7	49.0	68.5	71.1
San Marcellino e Festo	16.4	5.8	9.4	50.2	60.6	66.6	55.9	70.0	75.7
Accademia delle Belle Arti	9.7	12.4	16.6	52.2	59.3	61.9	64.6	75.9	82.2
Corte di San Domenico	16.0	11.6	11.7	43.1	55.1	59.1	54.7	66.8	70.6
Palazzo Real M. M. di Scala	13.2	7.8	12.8	48.1	56.3	61.3	55.8	69.1	73.3
Palazzo Diomede Carafa	12.3	12.3	12.7	47.7	56.9	60.0	60.0	69.6	74.0
Palazzo Venezia	9.4	11.9	13.3	48.0	55.2	57.4	59.9	68.5	73.5
Palazzo Marigliano	11.0	6.3	9.6	52.1	59.7	63.1	58.4	69.3	73.2
Balkapani Khan	4.3	8.9	5.3	53.7	60.5	58.0	62.6	65.8	69.9
Buyuk Valide Khan	10.7	10.5	4.3	51.6	58.9	62.3	62.1	63.2	68.7
Buyuk Yeni Khan	5.9	4.5	6.8	57.6	59.6	63.5	62.1	66.4	67.4
Veziir Khan	3.1	3.2	9.5	59.1	61.7	62.2	62.3	71.2	72.6
Tas Khan	5.2	11.7	8.6	49.1	57.6	54.3	60.8	66.2	67.1
Nuruosmaniye Mosque	5.8	3.9	9.1	60.3	62.2	66.1	64.1	71.3	71.3
Corlulu Ali Pasa Mosque	0.9	7.1	10.4	57.4	60.8	58.3	64.5	71.2	72.2
Gazi Atik Ali Pasa Mosque	9.2	7.4	12.6	53.7	59.2	62.9	61.2	71.8	72.4
Sehzadebasi Mosque	5.1	9.1	11.3	55.7	60.6	60.8	64.8	71.9	71.4
Suleymaniye Mosque	7.0	4.5	3.2	56.3	64.8	63.3	60.8	68.0	69.4

On the other hand, the A-weighted sound equivalent levels within cloisters and courtyards ranged from 43.3 to 60.6 dB(A) with background noise levels between 38.3 and



52.2 dB(A), while for Khan and Mosques, the A-weighted sound equivalent levels ranged between 57.6 and 64.8 with background noise levels between 49.1 and 60.3 dB(A).

In Italy, on average, the A-weighted sound equivalent levels inside the cloisters/courtyards were about 15 dB lower than the surrounding noise, reaching up to 25 dB for the cloister of San Domenico Maggiore and up to 21 dB for the cloister of San Paolo Maggiore. The lowest differences were measured at San Marcellino e Festo (9.4 dB) and Palazzo Marigliano (9.6 dB).

In Turkey, the A-weighted sound equivalent levels inside the Khan/Mosques were about 8 dB lower than the average surrounding noise. The most remarkable differences were measured at Gazi Atik Ali Pasa Mosque (12.6 dB) and Sehzadebasi Mosque (11.3 dB). In comparison, the lowest differences were measured at the Suleymaniye Mosque (3.2 dB) and Buyuk Valide Khan (4.3 dB).

#### 4.3. Perceptual Characterisation of the Sites

##### 4.3.1. The Perceived Restorativeness Scale (PRS)

Although areas with distinctive features, such as parkways lined by trees, the rustle of leaves in the wind or the sounds of flowing water, or that offer the opportunity to see the movements of clouds in the sky or the sunset, are generally associated with high levels of fascination [12,43], this study shows that historical value has a considerable effect on fascination. From the analysis of PRS-11 and its components, it can be seen that the sites located in Turkey (8.4) are considered more fascinating than those in Italy (7.4). This difference between the two countries may be explained by considering the different approaches used to conservation historic urban areas. In Italy, in recent decades, attempts have been made to adopt an integrated approach to the protection of cultural heritage, considering the complex relationships which exist between historical sites and the surrounding environment, as well as the economic and physical aspects of the territory, and giving greater importance to citizen's recognition of the qualities and vocations of the places of their life. However, in Turkey, there is a tendency towards the conservation of individual buildings. For this reason, the courtyards have different characteristics from the surrounding buildings. In historical city centres, places such as cloisters, courtyards, Khan, and Mosques, with their architectural characteristics, allow people to enter a different world, escaping from chaotic and vibrant urban centres and providing the visitors with a sense of being away from their stressful everyday life, in both countries (Italy 6.9; Turkey 6.5). Coherence and scope, related to characteristics such as physical arrangement, organisation, pertinence, dimensions and boundaries, were evaluated similarly in the two countries by participants. The Perceived Restorativeness Scale (PRS-11) results are favourable, with an approximate value of 7 out of 10 for both countries (Table 10).

**Table 10.** Perceived Restorative Scale Results.

	FAS		B-A		COH		SCO		PRS-11	
	ITA	TUR	ITA	TUR	ITA	TUR	ITA	TUR	ITA	TUR
Mean	7.4	8.4	6.9	6.5	6.3	6.2	6.4	6.4	6.8	6.9
Standard Deviation	2.0	2.1	2.3	2.6	2.3	2.5	2.1	2.1	1.7	1.6
Minimum	2.7	3.0	0.0	0.0	0.0	0.0	1.5	0.0	2.1	2.8
1st Quartile (Q1)	6.5	7.0	5.5	4.3	5.0	4.2	5.0	5.0	5.6	5.7
Median	7.5	9.3	7.0	7.0	6.7	6.3	7.0	6.3	6.9	7.2
3rd Quartile (Q3)	9.0	10.0	9.0	9.0	7.7	8.0	7.5	8.0	7.8	8.1
Maximum	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	9.8

##### 4.3.2. The Semantic Differential Scale

The validity of the differential scale was analysed over all 200 participants (Table 11). The Kaiser–Meyer–Olkin (KMO) test and Bartlett's sphericity test were used to verify the

sample's adequacy for factorial analysis. KMO index was 0.731, and Bartlett's sphericity test was significant at 0.001%. The extraction was based on the Principal Component model, considering the first five components. For the rotation, the Varimax rotation method with Kaiser Normalization was used. A minimum factorial saturation value of 0.5 was established. The Eventful–Uneventful pair was excluded because they obtained a factorial load below 0.5.

**Table 11.** Rotated component matrix of the Principal Component model.

	Components				
	Soundscape	Appreciation	Maintenanc/ Management	Importance/ Relevance	Activities
Loud–Silent_sounds	0.853				
Annoying–Pleasant_sounds	0.770				
Artificial–Natural_sounds	0.666				
Eventful–Uneventful					
Annoying–Pleasant_env		0.867			
Disappointing–Satisficing		0.867			
Irritating–Relaxing		0.515			
Dirty–Clean			0.752		
Untidy–Tidy			0.726		
Not Verdant–Verdant			0.687		
Dangerous–Safe			0.579		
Ordinary–Evocative				0.758	
Worthless–Important				0.751	
Monotonous–Interesting				0.622	
Vibrant–Boring					0.752
Chaotic–Calm					−0.651

From the 15 items, five macro-aspects of the sites were extracted:

- Soundscape: Loud–Silent\_sounds, Annoying–Pleasant\_sounds and Artificial–Natural\_sounds;
- Appreciation: Annoying–Pleasant\_env, Disappointing–Satisfying and Irritating–Relaxing;
- Maintenance/Management: Dirty–Clean, Untidy–Tidy, Not Verdant–Verdant and Dangerous–Safe;
- Importance/Relevance: Ordinary–Evocative, Worthless–Important and Monotonous–Interesting;
- Activity: Vibrant–Boring and Chaotic–Calm.

These five components explain 63.504% of the total variance: 14.951% Soundscape; 14.143% Appreciation; 13.800% Maintenance/Management; 11.586% Importance/Relevance and 9.147% Activities.

#### 4.3.3. Qualitative Aspects Questionnaire (QQA)

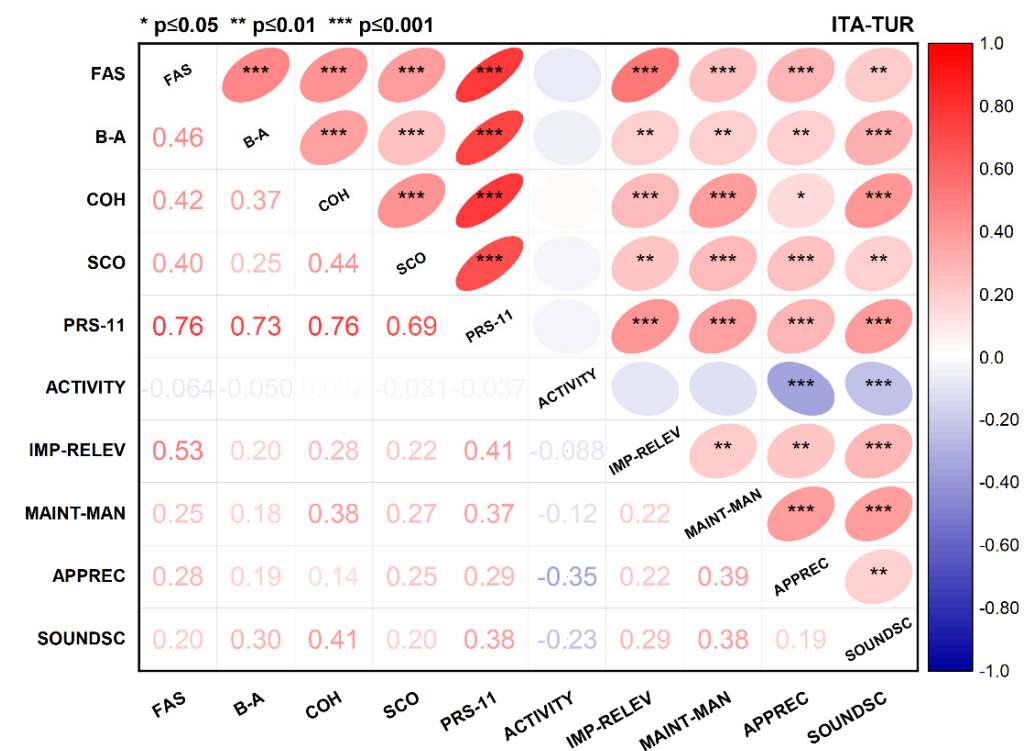
The Qualitative Aspects Questionnaire (QQA) results show that the features of historical and cultural value in these areas are important for participants of both countries (Table 12). Turkish participants gave a higher score to features such as historical-architectural aspects (QQA1), the presence of elements of cultural value as a distraction from the stress of everyday life (QQA2), curiosity aroused by historical urban areas (QQA4), the historical–cultural value of places as an escape from the real world (QQA5), and the effects of the type of entry on the distinction with the external environment (QQA6) than Italians, except regarding the effect the presence of information on artwork in the place has on increasing well-being (QQA3).

**Table 12.** Qualitative Aspects Questionnaire Results.

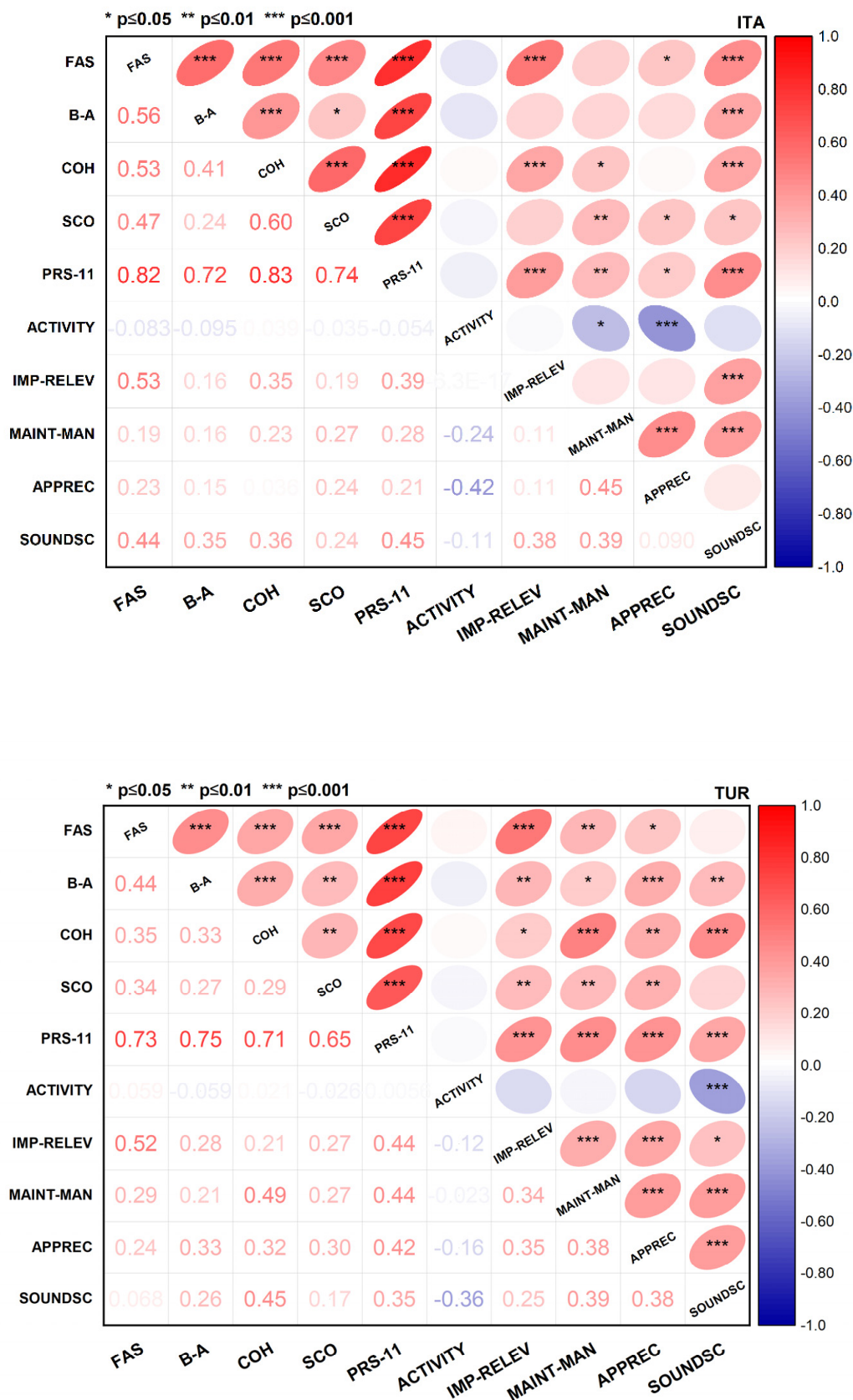
	QQA1		QQA2		QQA3		QQA4		QQA5		QQA6	
	ITA	TUR	ITA	TUR	ITA	TUR	ITA	TUR	ITA	TUR	ITA	TUR
Mean	5.9	6.8	5.8	6.3	5.6	5.3	6.0	6.8	5.6	6.4	5.8	6.1
Standard Deviation	1.4	0.5	1.3	1.2	1.5	1.9	1.2	0.6	1.4	1.0	1.3	1.4
Minimum	1.0	5.0	1.0	2.0	1.0	1.0	1.0	4.0	1.0	3.0	1.0	1.0
1st Quartile (Q1)	5.0	7.0	5.0	6.0	5.0	4.0	6.0	7.0	5.0	6.0	5.0	6.0
Median	6.0	7.0	6.0	7.0	6.0	6.0	6.0	7.0	6.0	7.0	6.0	7.0
3rd Quartile (Q3)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
Maximum	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0

**5. Correlations among Macro-Aspects, PRS, QQA and Sound Levels**

The Pearson correlations’ matrices of the five macro-aspects and the Perceived Restorative Scale were calculated for the all those interviewed (Figure 12), as well as for the Italian and Turkish sub-groups (Figure 13). Considering the full sample of 200 interviewed, Figure 12 shows that, except for Activity, all the factors are significantly correlated with all the dimensions of the PRS-11. High correlation coefficients emerged between Importance/Relevance and PRS-11 ( $r_{pear,ITA-TUR} = 0.41$ ), Soundscape and PRS-11 ( $r_{pear,ITA-TUR} = 0.38$ ), Maintenance/Management and PRS-11 ( $r_{pear} = 0.37$ ), and Appreciation and PRS-11 ( $r_{pear,ITA-TUR} = 0.29$ ). The strongest positive correlation coefficients emerged between Importance/Relevance and Fascination ( $r_{pear,ITA-TUR} = 0.53$ ).



**Figure 12.** Pearson correlation matrices of the five macro-aspects (Activity; Importance/Relevance; Maintenance/Management; Appreciation and Soundscape); the Perceived Restorativeness Scale (PRS-11) and its components: Fascination (FAS); Being-Away (B-A); Coherence (COH) and Scope (SCO). Total sample (Italian and Turkish).



**Figure 13.** Pearson correlation matrices of the five macro-aspects (Activity; Importance/Relevance; Maintenance/Management; Appreciation and Soundscape); the Perceived Restorativeness Scale (PRS-11) and its components: Fascination (FAS); Being-Away (B-A); Coherence (COH) and Scope (SCO). Left) Italian sample; right) Turkish sample.



An analysis of the correlations between the QQA items and PRS (Figures 14 and 15) was carried out to investigate the extent to which dimensions of the perceived Restorativeness are associated with the historical and cultural aspects of the sites. The results indicate that the dimension most influenced by these aspects is Fascination. In particular, the highest positive correlations were found between the ability of the historical and cultural aspects of the site to capture attention (QQA1,  $r_{\text{pear,ITA-TUR}} = 0.48, p \leq 0.001$ ), reduce the stress (QQA2,  $r_{\text{pear,ITA-TUR}} = 0.49, p \leq 0.001$ ) and of being-away (QQA5,  $r_{\text{pear,ITA-TUR}} = 0.47, p \leq 0.001$ ).

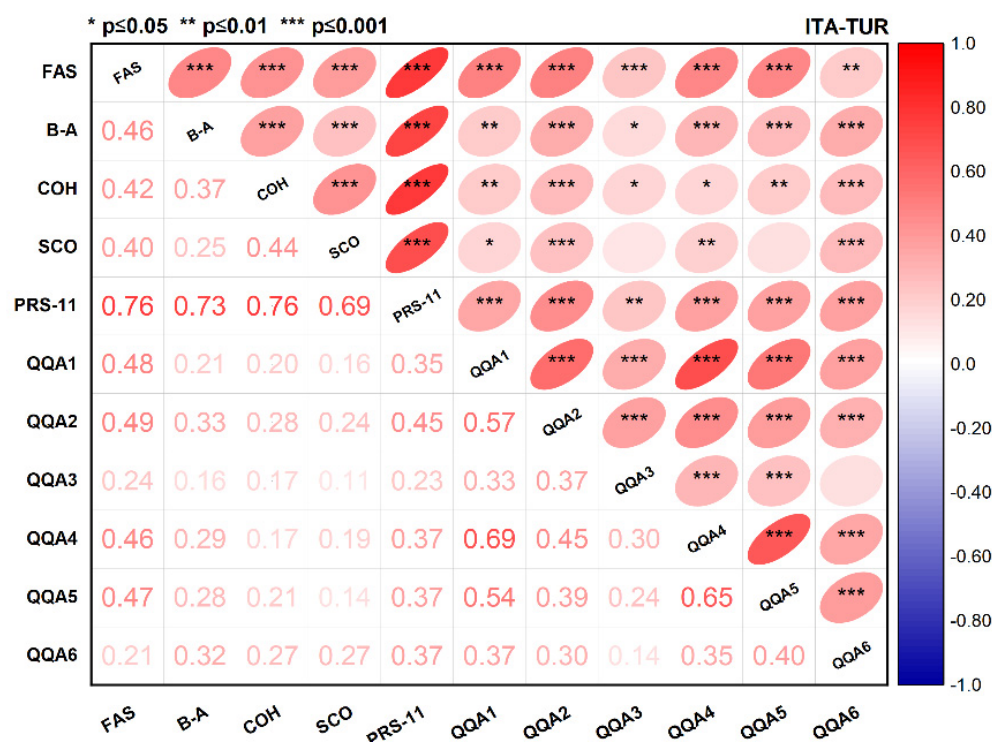
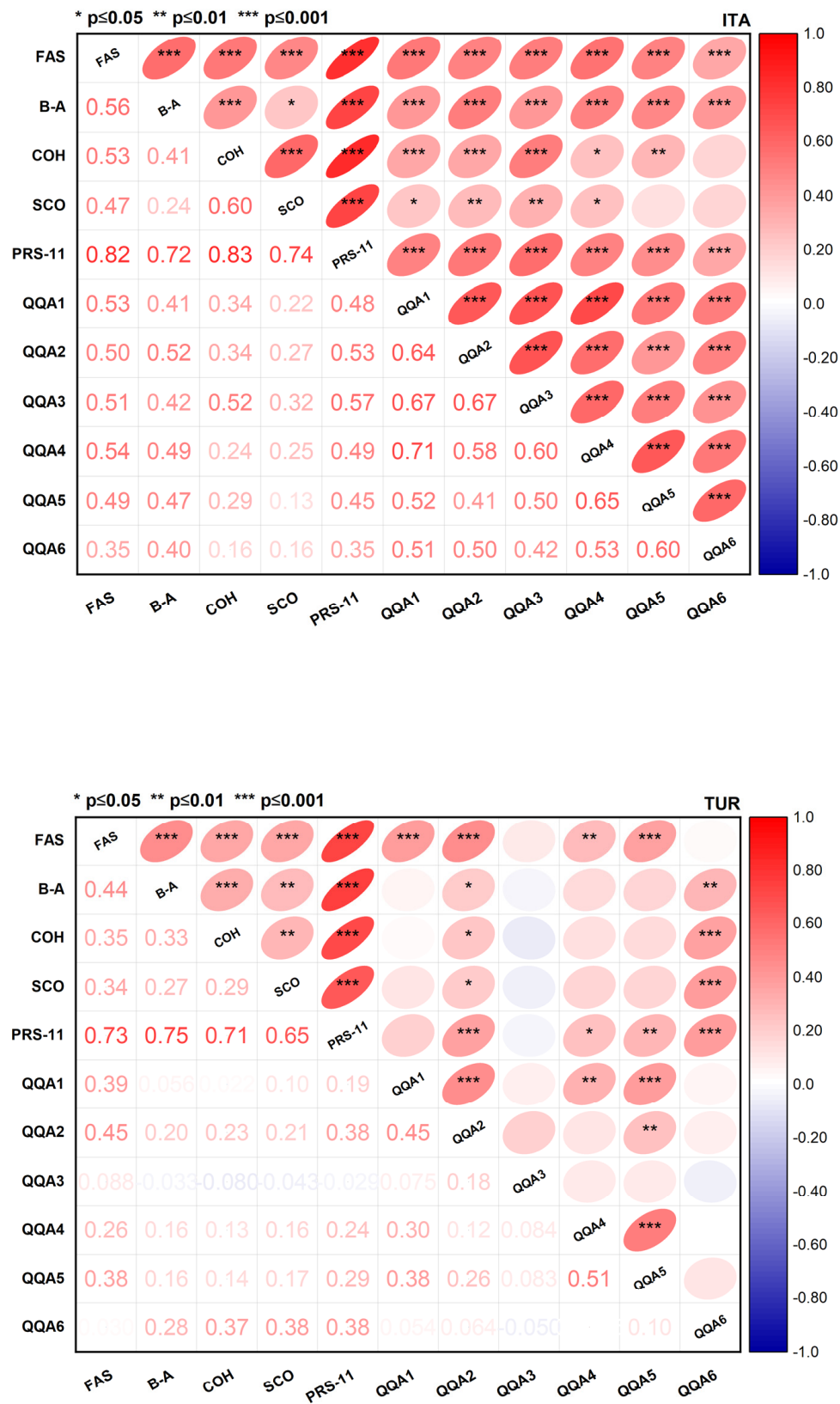


Figure 14. Pearson correlation matrices of the Perceived Restorativeness Scale (PRS-11), its components: Fascination (FAS); Being-Away (B-A); Coherence (COH) and Scope (SCO) and the Qualitative Aspects (QQA). Total sample (Italian and Turkish).

The correlations between the sound levels and the PRS (Figures 16 and 17) for all the participants have shown that the Restorativeness components are weakly correlated with the sound levels. Positive correlations were found between Fascination and  $\Delta L_{\text{PATH-IN}}$  ( $r_{\text{pear,ITA-TUR}} = 0.21, p \leq 0.01$ ), and Being-Away and  $\Delta L_{90,\text{PATH-IN}}$  ( $r_{\text{pear,ITA-TUR}} = 0.19, p \leq 0.01$ ). Nevertheless, the correlations are different between Italian and Turkish sites. For example, in the Italian sites, the positive correlations are consistent among most of the Restorativeness components (Fascination, Being-Away, Coherence) and the  $\Delta L_{90,\text{PATH-IN}}$  ( $r_{\text{pear,ITA}} = 0.20$  to  $0.24, p \leq 0.05$ ). This means that the perception of Restorativeness increases as the differences between the sound levels outside (path) and inside the site (in) increase. An opposite correlation emerges between the sound levels of the sites and Coherence ( $r_{\text{pear,ITA}} = -0.34$  to  $0.20$ ). The correlations for Turkish sites are almost all insignificant, except for those between the component Scope and the indoor sound levels ( $r_{\text{pear,TUR}} = 0.26$  to  $0.29$ ).



**Figure 15.** Pearson correlation matrices of the Perceived Restorativeness Scale (PRS-11), its components: Fascination (FAS); Being-Away (B-A); Coherence (COH) and Scope (SCO) and the Qualitative Aspects (QQA). Left) Italian sample; right) Turkish sample.

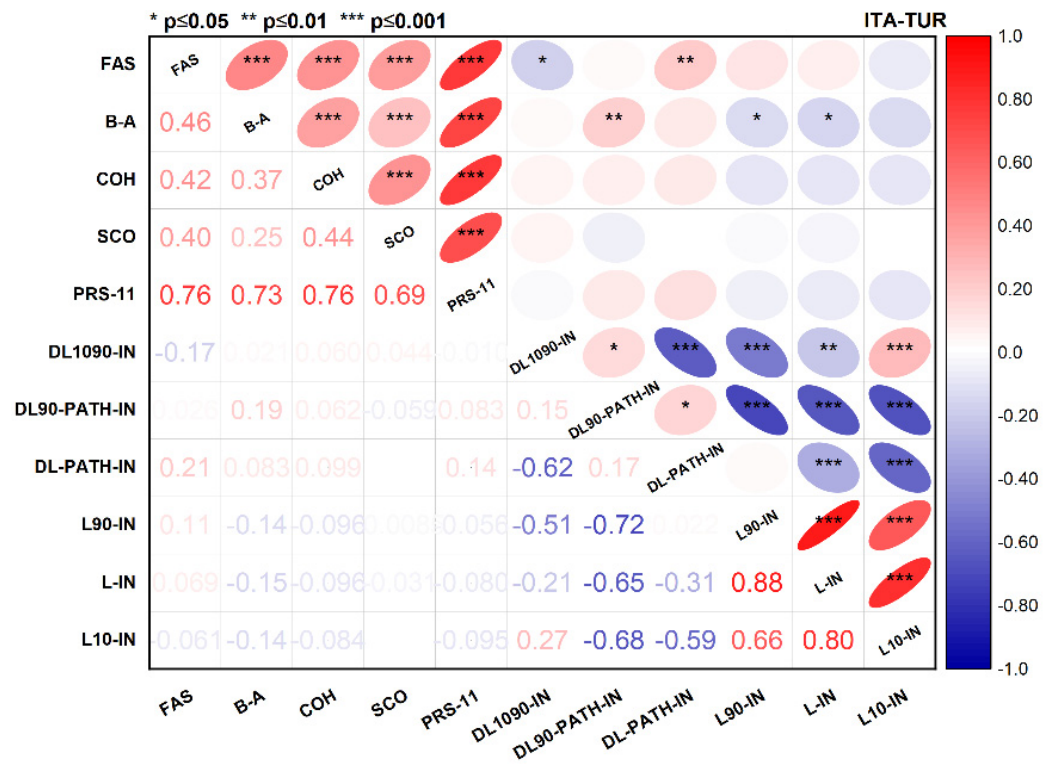
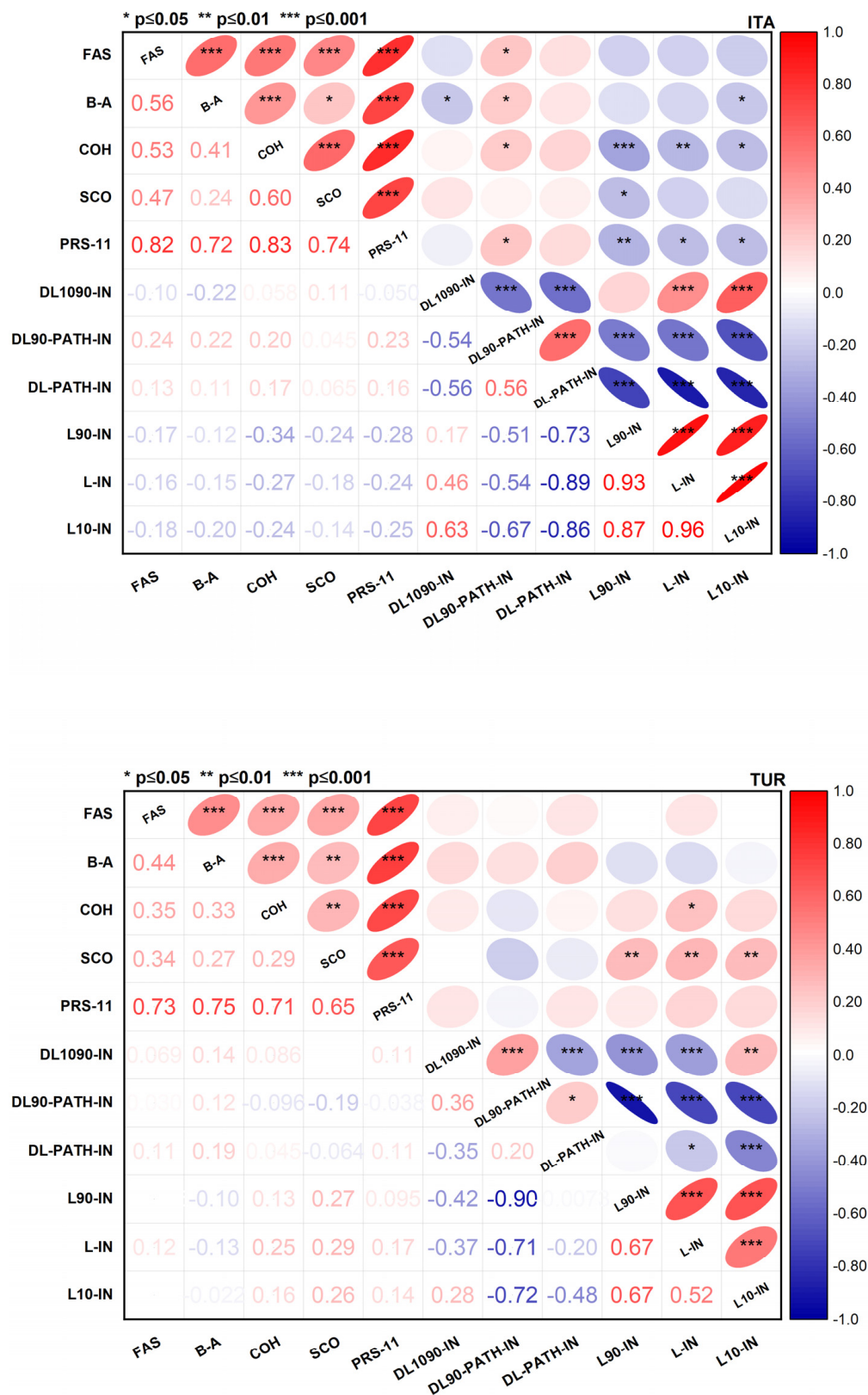


Figure 16. Pearson correlation matrices between the Perceived Restorativeness Scale (PRS-11) and its components: Fascination (FAS); Being-Away (B-A); Coherence (COH) and Scope (SCO), and the Sound Pressure levels inside and outside the sites. Total sample (Italian and Turkish).



**Figure 17.** Pearson correlation matrices between the Perceived Restorativeness Scale (PRS-11) and its components: Fascination (FAS); Being-Away (B-A); Coherence (COH) and Scope (SCO), and the Sound Pressure levels inside and outside the sites. Left) Italian sample; right) Turkish sample.



## 6. Conclusions

The description of the physical characteristics of the numerous outdoor historical sites, which are hidden and scattered through the urban areas of most historical cities in the world, represents the first step to understanding if it is possible to take advantage of these spaces, providing outdoor spaces where residents and tourists can escape from the noise and chaos of cities to relax or perform activities [44]. As has been demonstrated by several researchers, the restorative potential of these places does not depend solely on their acoustic characteristics (e.g., sound equivalent level, spectral and temporal properties). This is moderated by the presence of green (e.g., trees, grass, plants) [3–5] and blue (e.g., sea, lakes, rivers) [6,7] elements and other physical and individual factors [10]. In a broader EU vision, beyond accessibility to green urban parks, quiet areas must offer low sound levels from traffic and human activities, relief from environmental stress and opportunities to rest and relax [1].

As the main aim of this research was to understand if the historical–artistic component may be equally important in enhancing people’s Restorativeness levels, the study investigated the main perceptual dimensions that characterise human experience of some historical outdoor spaces, and the main correlations between them, with acoustic descriptors. The survey was carried out using in situ questionnaires and binaural sound recordings at outdoor historical sites inside the city centres of two cities with similar soundscapes and different cultures: Naples and Istanbul. The survey investigated the potential of those places, hidden inside the urban fabric of the historical centre of the cities. Although the sites can have the same scope, they belong to different building categories. In Italy, the sites were among the cloisters of the old monasteries and the courts of the historical buildings, while in Turkey, they were Khan and Mosque courtyards.

By observing the acoustic characteristics of the sites and emphasising the relationship with their surroundings, it emerged that these sites provide significant reductions in the A-weighted sound equivalent levels, ranging from 10 to about 25 dB(A). For almost three-quarters of the sites, 90th percentile A-weighted sound levels were lower than 55 dB(A). They were more than 6 dB higher than the external noise. The correlation between acoustic descriptors of the sites and Restorativeness shows that the most significant results concerned the negative correlations between the sound levels inside and some components of Restorativeness. Among the descriptors that explain the sound-level differences between the external sound and sound levels inside the sites, the 90th percentile sound level appears to have a better correlation with most of the restoration components. Although these findings are valid for the Italian sites, they are more controversial for the Turkish ones, where the sound levels seem less able to satisfy public restoration, i.e., for six of ten places, the 90th percentile sound levels were higher than 55 dB(A).

Interestingly, Factorial analysis showed that the main perceptual dimensions characterising these pockets of quiet are as follows: Soundscape, Appreciation, Maintenance/Management, Importance/Relevance, as well as the Activities characteristics. Consistent with the previous literature, and despite the reduced presence of green and blue compared to urban parks, a new, interesting perceptual dimension emerges. This is the Importance/Relevance of the site. This perceptual dimension is strongly correlated with all the components of Restorativeness, especially the Fascination component, and the findings are consistent between the Italian and Turkish groups. The results are interesting if we consider that hidden outdoor sites can easily be identified in several urban areas, and the conservation of quiet areas inside dense urbanised cities can be oriented beyond green or blue spaces.

When discussing whether courtyards in historical public buildings could be made available as quiet areas for restoration, in urban design, a few features of courtyards are foregrounded, such as high walls, a sheltered entrance, low density, plenty of trees, and historical and cultural value. The high walls and sheltered entrance lower the noise levels while enhancing the feeling of being in a different world to the outside environment. Low user density ensures low in-area noise levels. While the presence of trees makes the courtyard a more natural space, it also adds bird sounds to the sound environment.

Historical and cultural value is positive in increasing the sense of escape from the stress of daily life and feeling that one is in another world.

One of the critical aspects of promoting cloisters as places for restoration is knowing the factors that may affect, directly or indirectly, the restorativeness level of individuals. For instance, it is possible that some characteristics of the courtyards, such as the height to width ratio, which influence how people see cloud movements in the sky or the sunset, can be helpful in explaining why places with a low average height to width ratio, like the Khan (H/W = 0.61) and Mosque courtyards (H/W = 0.11) [42], had high Fascination ratings. Additionally, the increase in the number of people visiting the courtyards is expected to affect the perception of the restoration and its components. Monitoring these sites with smart devices could provide the comprehensive information needed to qualify the courtyards as “adapt”, or not, for psychophysical restoration, and make them available to residents and tourists through specific applications for smartphones. A future subject of investigation could be how much these environments remain in visitors’ minds after their experience.

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