ACOUSTICS 2012

Meaning of quiet areas in urban context through people viewpoints

P. Delaitre, C. Lavandier, R. Dedieu and N. Gey

Université Cergy Pontoise, 5 mail gay lussac, IUT Génie Civil, 95031 Cergy Pontoise, France
pauline.delaitre@u-cergy.fr

Quiet areas in the European Directive 2002/49/EC are characterized with an acoustic level. But since 2002 some studies have shown that quiet areas can be characterized also with other parameters depending on personal or common representations: the meaning of the sound sources, the relative aspect, the visual environment, etc. The Q-methodology has been chosen to reveal the different groups of people who share the same representation of quiet areas. Consequently, a questionnaire has been developed on internet, where people were asked to evaluate their agreement in regard to 47 statements on a Lickert scale. From 200 participants, 5 groups have been revealed. For the greatest group of persons, the presence of typical sources, such as water or birds, is the most important characteristic of quiet areas. This profile brings together persons who mostly live in town. Another group gathers people who are interested in escape from the daily life. Another group of persons focuses on their psychological rest. These different points of view have to be taken into account by urban planners when they want to preserve or create some quiet areas in an urban context.

1 Introduction

Since the European Directive 2002/49/EC [1], the characterisation of quiet areas became an important issue. In France, few studies have been realized. But they show the existence of diverse personal or common representations of quiet areas [2][3].

Starting from these results, this study proposes to explore these representations by bringing together people who share the same viewpoint about quiet areas. The method used is called Q-methodology. It has been chosen to reveal the different groups of thinking. This method was already used in several studies in particular in 2007 and 2009 to study people's internal frame of aircraft noise [4][5].

2 Methodology

The Q-methodology was developed by psychologist and physicist William Stephenson in the 30s. Afterwards, this methodology was used by other researchers, one of whom was Steven R. Brown who wrote tutorials [6][7].

The principle of the survey is to give a list of sentences (generally between 30 and 50) to the participants and to ask them to classify the various sentences. The survey is built to force people to choose among sentences and to take a stand. That's why the survey is made up of three steps.

In the first step, the participants have to classify each sentence in one of three columns: do not agree, neutral and agree, Figure 1. This step allows participants to read first all sentences and make a rough selection.

Figure 1: First step of Q-methodology.

In the second step, the same sentences divided in three groups are proposed again to the participants. Then, they have to class them in a pyramid with a Lickert scale: From -5, "I do not agree with" to +5, "I agree with", Figure 2. The participants have to choose the two sentences for which they agree more and the two for which they disagree more. It is a way to normalize the subject answers.

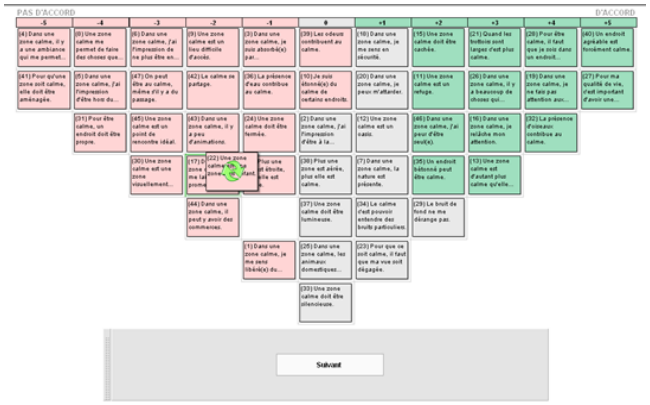

Figure 2: Second step of Q-methodology: the pyramid

The third step is a personal questionnaire (age, profession, etc).

3 Procedure

The choice of the sentences is very important. Each sentence must be very simple and has to express only one idea. In this study, 47 sentences have been written (Table 2). These sentences were built from inhabitant discussions during workshops [8]. But they are also inspired by previous studies on quiet areas [2] [3] or on restorative environments [9] [10].

To ask a large panel, the survey was developed on the Internet: http://iutcergy.org/clrech/sondage/ with FlashQ software [11].

4 Analysis

The data are collected in the form of a matrix. The aim of Q-methodology is to group together persons who share the same point of view. So the persons are the objects of the matrix and the answers are the variables.

4.1 Principal Component Analysis

To assess the representations of participants, a PCA (Principal Component Analysis) was conducted. First, a correlation matrix of all participants is calculated. It represents the level of agreement or disagreement between each person. Then, a factor analysis is realized on this correlation matrix. Groups of person with the same points of view are identified. An orthonormal basis is built and the second correlation factor is calculated for each participant.

This factor expresses the similarity or dissimilarity between persons and axes.

To improve correlations, the rotation named "Varimax" is used. The rotation is a change of coordinates in order to maximise the sum of variance.

In the original Q-methodology process, PCA is realized on seven axes. This criterion is nonstatistical but experience has indicated that it is generally suitable [6]. However, it is recommended to choose a large number of axes not to forget any point of view. From this perceptive, in this study PCA is realized on fifteen axes.

4.2 Representative persons and axes

To highlight the various points of view, it is important to select only representative people. The correlation coefficient between people and axes makes it possible to select these representative people. The threshold is of 0, 3721 ($p<0.01$ for 47 questions) [12]. To be selected, a participant must be correlated with only one axis. If he/she is uncorrelated or correlated with two or more axes, participant is not representative of one typical point of view.

In the Q-methodology process, an axis is worth studying if it is made up of at least two persons. But it is important to note that usually Q-methodology test is realized on one hundred of persons [6]. This questionnaire about quiet areas has been realized by 302 persons. That's why this standard is increased. In this study, an axis is selected if it is made up of at least five persons.

4.3 Pyramids of points of view

The final step of analysis is calculation of matrix which represents the typical points of view. This corresponds to the typical pyramids of answers. For this part, only representative persons are kept to calculate typical pyramid of each axis. In fact, pyramid of answers is a weighted mean of typical answers of the axis with the weight of participants. The better correlation between subject and axis, the bigger the weight.

Actually, these analyses produce the pyramids of various points of view and bring together people who share the same representation.

5 Results

During three months, 302 persons have answered to the questionnaire which has been analyzed on fifteen axes after rotation. The results show the presence of three main groups (axes 1, 2 and 3) and six secondary groups (axes 4, 6, 8, 9, 10 and 13) Table 1.

Table 1: Number of persons correlated with only one axis.

Axis	1	2	3	4	6	8	9	10	13
Representative Persons	62	57	14	5	5	7	5	5	5

Actually, 165 persons have a typical point of view about quiet areas. The other participants have points of view shared between the various typical viewpoints. The typical matrix is presented in Table 2. This table shows the position of sentences in representative pyramids, for each group.

6 Analysis of the main viewpoints

6.1 Common representation

Some sentences are always assessed positively by all people who filled the questionnaire (for example sentences 1, 4, 5, 11, 27 and 42 in this study). Among these sentences, the sentence 27 is assessed very positively. There is only one group which does not completely agree with this sentence.

Other sentences are always assessed negatively by all people who did the questionnaire (sentences 14, 15, 21, 24, 26 and 40). A lot of these sentences are about spatial construction of quiet areas. It seems that shape of an area is not an important feature which would participate to its quiet quality.

6.2 First viewpoint: social relationships

The first axis is composed of 62 representative persons (Table 1). This group agrees with the sentences 42, 47 and 20 more than the other groups (Table 2). Conversely, they disagree with the sentences 22, 33 and 43.

For these people, liveliness is an important characteristic which qualify the quiet areas. The results show that they want to share the quietness. However, this group strongly disagrees with the sentence 46 (-4, in Lickert scale): "In a quiet area, I am afraid of being alone". That could be contradictory to the desire of relationships. But the meaning of this sentence is correlated with the feeling of security as revealed in Table 2 by comparing the sentence 46 and 18. That is to say that this group feels safe anyway with and without people

On the other hand, they don't pay attention on the environment. The nature (sentence 7, +1, Table 2), the birds (32, 0), the countryside (2, -2) are not very important.

For this group, a quiet area is an area where it is possible to spend time with others. The study of the personal questionnaire shows that the persons of this group live generally in city center. That, in this group, 53,2 % of persons live in city center, which is statically different from the 37,4 % of the initial corpus ($z = 2,57$, $p < 0,05$ [13]). This result can explain the desire of sharing with others in quiet areas and the little attention to the nature.

6.3 Second viewpoint: sources

The second axis is composed of 57 representative persons, Table 1.

In this group, they agree with sentences 2, 4, 7, 32 and 36. For these people, the nature is an important characteristic.

Logically, they don't agree with sentence 35 which is: "A concreted area is quiet".

The quietness can be found in the countryside and out of city. People focus on the sources of noise: the birds (32, +4), the water (36, +4), etc. The background noise disturbs them. They have an analytic listening of their environment [14].

For this group, there is not a typical profile of representative persons. This representation of quiet areas is shared by various types of persons.

Table 2: Sentences and results of the Q-methodology about quiet areas.

N°	Sentences	Ax1	Ax2	Ax3	Ax4	Ax6	Ax8	Ax9	Ax10	Ax13
1	In a quiet area, I feel released from my work and from my everyday life.	1	2	1	1	3	1	1	2	4
2	In quiet area, I have got feeling to be in the countryside.	-2	3	-1	5	1	-4	1	5	-3
3	In a quiet area, I am absorbed by environment.	-1	2	0	4	2	-2	-2	0	0
4	In quiet areas, there is an atmosphere which allows me to escape.	3	3	3	2	2	1	5	1	2
5	In a quiet area, I feel I am being out of time.	2	1	1	3	4	4	5	1	0
6	In a quiet area, I feel I am not being in town.	-2	1	1	3	0	-2	2	3	1
7	In a quiet area, the nature is present.	1	5	-2	2	-1	1	1	0	3
8	A quiet area allows me to make things which I cannot make elsewhere.	1	-1	2	3	-4	0	3	-5	-1
9	A quiet area is an area difficult to access.	-4	-3	-2	-2	1	-1	-3	-2	-3
10	I am surprised by the quietness of certain areas.	2	-1	3	-2	0	-1	0	2	-1
11	A quiet area is a refuge.	3	1	5	1	1	0	3	1	4
12	A quiet area is an oasis.	2	2	4	-1	-1	-2	1	0	0
13	A quiet area is all the more quiet since it contrasts with what is surrounding.	2	-1	3	4	1	0	0	0	1
14	The narrower a street, the quieter.	-3	-4	-3	-4	-3	-5	-5	-1	-4
15	A quiet area must be secret.	-4	-4	-3	-4	0	-5	-1	-3	-3
16	In quiet area, I release my attention.	0	-1	0	-3	3	-1	4	-2	0
17	In quiet area, I let myself walk, mindlessly.	2	1	0	0	4	4	2	-1	3
18	In a quiet area, I do feel safe.	0	1	1	-2	-4	3	2	0	2
19	In a quiet area, I do not care about the others do.	-3	-2	-1	-5	-2	0	1	1	-2
20	In a quiet area, I can linger.	4	3	3	-1	1	3	3	1	1
21	When pavements are wide, it is calmer.	-1	-2	-2	-4	-3	0	-3	-1	-1
22	A quiet area is an area without children.	-5	-3	0	0	-2	4	3	-2	-2
23	In order to be calm, my view has to be free.	-1	-1	-2	-3	-4	1	-2	-4	-4
24	A quiet area must be closed.	-5	-5	-4	-5	-2	-4	-5	-2	-1
25	In a quiet area, pets do not disturb me.	0	-1	-5	1	2	0	4	2	1
26	In a quiet area, there are many things which intrigue me.	-1	-2	-1	0	-1	-2	-1	-4	-5
27	For my quality of life, it is important to have a quiet area nearby.	5	5	4	4	4	2	4	4	5
28	To be calm, I have to be in a quiet place.	-3	0	-1	1	-3	-3	1	-3	5
29	The background noise does not disturb me.	1	-4	-4	-3	-1	-3	-1	3	-5
30	A quiet area is a visually pleasant area.	0	4	0	0	-2	3	-1	3	2
31	To be quiet, a place must be clean.	0	3	-1	-1	-1	5	0	4	2
32	The presence of birds contributes to quietness.	0	4	1	2	2	-3	0	4	-3
33	A quiet area must be silent.	-2	0	5	3	0	5	0	1	3
34	The quietness makes it possible to hear particular noises.	3	2	1	5	-3	-2	-1	-1	0
35	A concrete area is quiet.	3	-2	2	2	3	2	-1	0	2
36	The presence of water contributes to quietness.	4	4	2	-2	5	-1	2	5	-2
37	A quiet area must be bright.	-1	0	-3	-1	1	-1	-2	-4	0
38	The more aerated area, the calmer.	-1	1	-1	-1	-1	2	-4	-3	-2
39	The smells contribute to calm.	0	2	0	0	2	2	-4	-1	-1
40	A pleasant area is inevitably quiet.	-3	0	0	-3	-5	-3	-2	-2	-2
41	In order to be quiet, an area must be laid out.	-2	-3	-2	-2	-2	-1	-4	2	-1
42	The quietness can be shared.	5	0	2	1	0	3	2	2	1
43	In a quiet area, there's not much liveliness.	-2	0	4	2	3	2	0	-3	1
44	In a quiet area, it is possible to have shops.	1	-2	-3	0	0	0	-3	-1	4
45	A quiet area is an ideal gathering place.	1	0	2	-1	-5	1	0	0	0
46	In a quiet area, I am afraid of being alone.	-4	-5	-5	1	5	-4	-3	-5	-4
47	We can be in the quiet, even if there is of the passage.	4	-3	-4	0	0	1	-2	3	3

6.4 Third viewpoint: silence

The third axis is composed of 14 representative persons (Table 1). For this group, the main characteristic of a quiet area is silence (Sentence 33, +5). People don't want any noise. The particular noises (34, +1), the birds (32, +1), the water (36, +2) are not important in a quiet area. The background noise disturbs them (29, -4). They want an area which contrasts with their usual environment (see sentences 11, 12 and 13.

Contrarily to the first axis, they seek an area without liveliness (43, +4). They don't want any activities with passage (47, -4) and shops (44, -3).

This group is mainly composed of men compared to the initial corpus ($z = 1, 98$, $p < 0,05$ [13]). Two thirds of people are men.

7 Other viewpoints

The last six groups composed of 32 persons are less representative than the previous three (Table 1). With fewer people, statistical analysis of profiles cannot be realized.

However, their viewpoints are interesting because they reveal some interesting characteristics.

7.1 The security feeling

The fourth group tends to look like the second group even if it has not the same sonic environment representation. Contrarily to the axis 2, the persons of axis 4 seem to have a holistic listening of their environment [14] (33 and 34). Their attention is not focused on sources like birds (32, +2) or water (36, -2).

The main difference between the fourth group and the second is the safety feeling (18 and 46). The participants of the fourth group do not feel safe in the quiet areas.

For this group the main points are the escape (sentences 1, 2, 3, 4, 5 6 and 7) and the security.

The sixth group looks like the fourth axis. People have the same point of view about the safety feeling. This feeling is even more important for this group (18, -4 and 46, +5).

However, there are some differences about the escape. For the axis 6 the temporal escape (1, +3 and 5, +4) is more important than the spatial escape.

Lastly, it is important to note that all people in the fourth group live in countryside and all people in the sixth group live in town. So the feeling of insecurity is not connected with the place where people live.

7.2 The absence of children

The eighth axis looks like the third axis. Both agree the sentence 33 about the silence (+5). For the persons of this group, a quiet area is an area which makes it possible to break from the daily life. However, compare with the third axis, this group don't want any source of noise. The particular noises (34, -2), the birds (32, -3) and the water (36, -1) are perceived negatively in the quiet areas.

The persons of this axis and the ninth axis share the same viewpoint about the sentence 22. They agree with: "A quiet area is an area without children". But it is not the only common point. In the personal questionnaire, each person answered that he/she has no child. This result reveals that some persons who have no child imagine the quiet areas as areas without children.

7.3 The sensitive experience

The tenth axis seems to look like the second axis. People want nature element in the quiet areas like water (36, +5), birds (32, +4). They feel they are in the countryside (2, +5).

They have also an analytic judgment of their sonic environment but contrary to the axis 2, they give more importance to all sensitive experiences: hearing, vision (30 and 37) and smell (31). For these other senses and with these sentences, it seems that their representation can be more holistic than the second group.

7.4 The psychological rest

The last axis tends to look like to third axis. People want silence (33, +3). They want to escape from the daily life (1 and 11). But the sentence: "To be calm, I have to be in a quiet place" (28, +5) is the sentence for which they strongly agree. They need a psychological rest.

All persons of this group are in working life. They are employee, middle executive, or senior executive. This can explain this particular need.

8 Conclusion

Globally, there are three viewpoints about quiet areas: once focusing on the social relationships, one focusing on sound sources and one on silence. The need of relationships gathers people living in city center. The sound sources are connected to the nature with two different perceptions: a holistic perception and an analytic perception.

Some people focus their attention on security but it is not connected with personal parameter. It is different for the presence of children. Some persons, who have no children, don't want them in quiet areas. Lastly, people, who work hard, need a quiet area for psychological rest.

Is it possible to satisfy all types of persons in a same area? Is it possible to have silence at the same time with social relationships? Urban planners would have probably to choose what group to favor.

Besides, there is a consensus on sentence 27 about the importance of having a quiet area nearby. This is not a sound characteristic but it is an important element for urban planners who must preserve and create the quiet areas.

Acknowledgments

This work has been accomplished inside the French Ile de France sustainable development programme (R2DS).

References

[1] Commission of the European Directive, *Directive 2002/49/EC relating to the assessment and management of environmental noise,* European Commission (2002).

[2] Institut d'Aménagement et d'Urbanisme de la Region Ile de France, *Etude exploratoire sur la notion de "zone de calme",* IAURIF, Paris (2006)

[3] G. Faburel, N. Gourlot, *Référentiel et guide national pour la definition des zones calmes en ville*, Rapport Final, Université de Paris XII (2008)

[4] C. Broër, *Aircraft noise and risk politic,* Health Risk Soc, Vol.9, pp. 37-52 (2007)

[5] M. Kroesen, C. Bröer, *Policy discourse, peolple's internal frames, and declared aircraft noise annoyance: An application of Q-methodology, J. Acoust. Soc. Am.* 126(1), 195-207 (2009)

[6] S.R. Brown, *Political Subjectivity application of Q methodology in political science,* Yale University Press, New Haven and London (1980)

[7] S.R. Brown, *A Q-Methodology turorial,* (1992) available at http://facstaff.uww.edu (page visited the 21.02.2012)

[8] P. Delaitre, M. Basile, C. Lavandier, *Participative workshops in the process for the creation of a questionnaire about the definition of quiet areas in French cities,* Proc 2011 Forum Acusticum, Aalborg

[9] R. Kaplan, S. Kaplan, *The experience of nature: A psychological perspective*, Cambridge University Press, Cambridge (1989)

[10] S.R. Payne, *Urban park soundscapes and their perceived restoration,* Proc 2010 IoA, Ghent

[11] C. Hackert, G. Braehler, *FlashQ,* (2006) available at http://www.hackert.biz/flashq/home (page visited the 21.02.2012)

[12] G. Saporta, *Probabilité, analyse des données et statistiques,* Technip Ed., Paris (1990)

[13] M. R. Spiegel, *Probabilités et statistique,* Ediscience International Ed. (1996)

[14] D. Botteldooren, C. Lavandier, A. Preis, D. Dubois, I. Aspuru, C. Gustavino, L. Brown, M. Nilsson, T.C. Andringa, *Understanding urban and natural soundscapes,* Proc 2011 Forum Acusticum, Aalborg