



A preliminary investigation about the influence of soundscapes on people's behaviour in an open public space

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ABSTRACT

Relatively few studies have investigated the relationships between soundscape and human behaviours with the purpose of improving the management of public urban spaces. This research aims to provide more insights into this relation. For this purpose an experiment based on covert behavioural observations was performed in a typical open public space, mainly used as a connection between different buildings. Three musical excerpts (and silence) were reproduced cyclically to test whether music could affect people's duration of stay in the investigated area. Preliminary results show that the presence of music is associated with a longer duration of stay, compared to silence, and classical music was associated with the longest duration of stay, overall. Moreover the association between the activities' occurrence and the different music excerpts was investigated. The collected data indicate that, compared to the other music genres and silence condition, classical music is a loitering incentive, while both cirrus and classical excerpts encourage the presence of chatting and eating/drinking events. Such findings suggest that there is a potential to implement soundscape strategies in urban design and planning, showing how to intervene in the urban sound environments in order to promote healthy social behaviours.

Keywords: Soundscape, perception, behavioural observation

1. INTRODUCTION

The management of the acoustic environment, mainly focused on noise control engineering and retrofitting approach, has gained growing interest at an academic and administrative level and has moved forward to exploring the potential of soundscape as a tool for urban planning and public spaces design (1)(2)(3). Latest studies have focused on the effectiveness of soundscape's target strategies on the sustainable development of cities and the improvement of the health and the quality of life (4).

Although in the field of marketing research the effect of ambient music has been investigated in terms of pace of shopping, time and money spent in shopping malls or restaurants, there are limited studies investigating the effect of sound in other spaces. Witchel et al. (5) conducted studies in which an outdoor acoustic environment was manipulated, aiming to improve public behaviour, health and enjoyment of a specific context, such as the main street of Brighton's busiest clubbing and entertainment district (4). Schafer (6) suggested that a good acoustic design of spaces could affect people's mood and feelings acting as a "harmonizing influence". Sayin et al. (7) demonstrated that sounds have a significant effect on the perceived safety of individuals in public places. They also underlined how this kind of impacts could have managerial implications in terms of people reluctance and avoidance to go to specific places such as car parks, metro stations and green areas and the possible economic consequences.

Starting from these important clues, more researchers have begun to further explore the potential impact of soundscape management and acoustic environment manipulation on the behavioural observation in these contexts (8). Nevertheless, to effectively include soundscape into urban design practices and policies it is essential to clearly define the relationship between sound and human

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activities in the urban environment. Consequently, case studies that connect and quantify the impact of soundscape characterizations into perceptual, social and health outcomes are needed. These are going to be useful in the construction and validation of credible urban sound planning strategies (9, 10).

Therefore, the aim of this study is to assert whether:

1. there is an effect of added music sounds on people's duration of stay in public urban spaces;
2. there is an association between the occurrences of some activities and particular music excerpts.

For this purpose, covert behavioural observations were performed in a typical open public space, mainly used as a connection between different buildings within the Sheffield University campus. Different music excerpts were added to the existing acoustic environment, while video processing of the data recorded was proposed as a method for automatically characterising the observed behaviours (5).

2. METHOD

The case of Concourse Bridge is a non-participant, covert observation study during which three musical excerpts and silence were reproduced to test whether and how the specific acoustic design could boost specific public behaviours.

2.1 Data Collection

The individual experience of the acoustic environment may be conducted in situ, simulated or reproduced, or recalled in memory (11). When the acoustic environment is experienced in situ, researchers typically use soundwalks and collect the data through questionnaires, semantic scales or interviews. However, in most cases data collection is participative and participants are required to have an attentive listening style. This raises a question about whether being 'aware' of taking part in a soundscape study might actually affect the responses people give (11). Hence, the case of Concourse Bridge is a non-participant, covert observation study during which the users -unaware of the experiment- were video-recorded and the final subconscious and spontaneous responses, constituted the database used for later behavioural analysis (11).

2.2 Study area

The open public space under the raised vehicular Concourse Bridge, in the Sheffield University campus was chosen as a case study for the experiment performed. The pedestrian area which forms a link between different departmental buildings and the central building of the Students' Union, where services and administration offices, as well as bars, restaurants and shops are located, constitutes a node where people usually stop for a break between the various sites within the campus. Having lunch, talking on the phone, smoking, loitering and chatting are some of the main activities taking place in the investigated area. Given the centrality of the area, the space, divided by pylons in two branches, presents along the edges low solid parapets used like benches in order to facilitate people's stay. The investigated area could be a potentially fertile place for "social occasions".

2.3 Equipment

The experiment was conducted during five consecutive working days in February 2015. A laptop with driver software of the audio card (for outputs regulation) and software VideoLan VLC that allowed to mount the music excerpts in loops, a professional audio card (RME Babyface) connected both to the laptop and with two loudspeakers (Genelec 8030B) and finally two cameras Sony handycam DCR-DVD115 for the video recording were used for data collection.

In order to avoid any influence caused by the presence of the camera or interaction with the research team, both cameras were placed at the first floor of the Students' Union building and were set to a low resolution so as to avoid the identification of the passers-by. The location of the cameras is shown in Figure 1, while the location of the loudspeakers in Figure 2.



Figure 1 - Photo of the investigated area showing the location of the camera system



Figure 2 - Photo of the public space under the bridge showing the location of the music intervention system

2.4 Materials and Procedures

During the experiment, three musical excerpts and silence were reproduced cyclically between 10:00 am and 2:00 pm. Cirrus (lounge/chill out music), Jazz and Classical were the selected stimuli for interventions on the acoustic environment under the bridge, based on the method used in the experiment by Witchel et al (12). Accordingly, the music excerpts were designed to be:

- 1) “inclusive”: ensuring divergent genres were included in each playlist;
- 2) “non-aversive”: not played with loud volumes or too displeasing (e.g. atonal music);
- 3) sounding good in a highly reverberant environment tunnel (e.g. music that has a narrow dynamic range; clear and simple melodies; notes/timbres with a wide frequency spectrum; notes with strong attack / peaks).

The ambient/background music intervention consisted of 180 minutes of reproduction for every single music excerpt, distributed over the five days of the experiment. A rotation of the stimuli was set across the week and the daily time slots, in order to obtain the widest range of observations for the same music excerpts through different days and times.

A set of background noise measurements was carried out to guarantee that the sound pressure level (SPL) of the stimuli would exceed the background noise. The average background noise level was found to be 60.7 dB(A), so the loudspeakers' gain was set accordingly.

2.5 Analysis of behaviour

The aim of this study is firstly to determine whether the overall presence of music against a condition of no acoustical manipulation of the sound environment (only background noise) affects consistently people's duration of stay, and secondly to examine if the presence of a specific music genre might deter or encourage some particular activities.

Thus, the collected camera recordings were used as a database to investigate users' behaviour in response to sound. A direct observational assessment of people's behaviours was performed by means of the “Behavioural Observation Research Interactive Software” (BORIS), version 2.95, (13). Ethogram tables, a common technique used by behavioural researchers in order to measure and

construct the list of the observed behaviours (14), were the elements that constituted the structure of the software.

In the current study the list considers a number of activities defined initially through a preliminary screening of the video recordings, such as: talking on the phone, eating/drinking, chatting and loitering, that were the most recurrent ones. Subsequently, the selected activities mentioned above were carefully identified and then defined in terms of duration and stimulus for each observational day. Finally, the number of passers-by under the bridge was registered to examine the total number of subjects passed during the single stimulus.

Once constructed, the Ethograms' tables provided information about the total number of subjects involved in each observation, the active ones in performing the analysed activities and the duration of each activity in seconds, coupled with the duration of each stimulus.

3. RESULTS

3.1 Effect of music on the duration of stay

A one-way ANOVA test was conducted to investigate whether the presence of background music statistically affects people mean duration of stay. The analysis of variance showed that the effect of music was significant [$F(3) = 9.471, p < .05$].

The post hoc analysis using Bonferroni correction revealed that the differences in people duration of stay between the silence condition and the three background music excerpts condition were relevant for rejecting the null hypothesis of casual correlation between variables: based on the comparison between Silence condition ($M = 132.18$) and Classical music ($M = 320.57$), the comparison between Silence and Cirrus excerpts ($M = 274.69$), and the comparison between Silence and Jazz music ($M = 257.56$), it is possible to assert that the generic presence of music implies a longer mean duration of stay, and that the longest duration of stay is detectable with the presence of classical music. However, no significant difference was observed between the duration of stay recorded during the three different stimuli, so no other relative effect could be stated according to the different music genre, as shown in Figure 3.

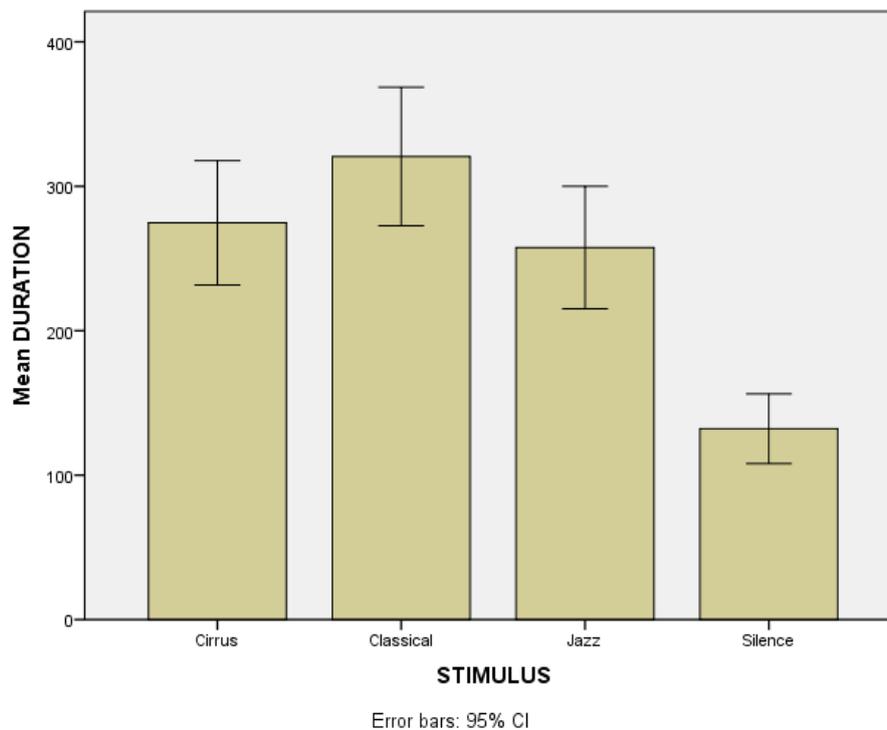


Figure 3 - Difference in mean duration of stay during Classical, Cirrus and Jazz excerpts and Silence

3.2 Association between activities and music excerpts

After excluding the influence of the total number of passing-by persons on the effective number

of the subjects that have stopped (this relationship has proven to be non-linear), a chi-square test of independence was performed to examine the correlation between the presence of different stimuli and the occurrence of the considered activities. The relation between these variables was significant, $\chi^2(2, N = 589) = 12, p < .05$. Classical music was associated with a major number of loitering events than expected by chance. This evidence suggests that, compared to the other music genres and silence conditions, classical music is a loitering incentive. A previous investigation about the effect of music in an underground passageway for pedestrians was conducted to enable a better evidenced measure of soundscape's safety techniques (8), where "loitering" was characterised in "territorial terms", as a way of affirm a spatial ownership, which tends to discourage other public subjects in experiencing the area. In the case of the current study, the situation is different, as loitering events are considered as possible indicators of environmental pleasantness that leads the subjects to stop in the study area without a real practical purpose. The occurrence of loitering episodes does not have any kind of interference with the other daily recurrent activities.

Moreover, it could be noticed that with the presence of music, a major number of smoking episodes occurred with respect to the silence condition. Finally, a higher numbers of chatting and eating/drinking events were reported than randomly expected during the cirrus and classical exposure time as shown in Figure 4.

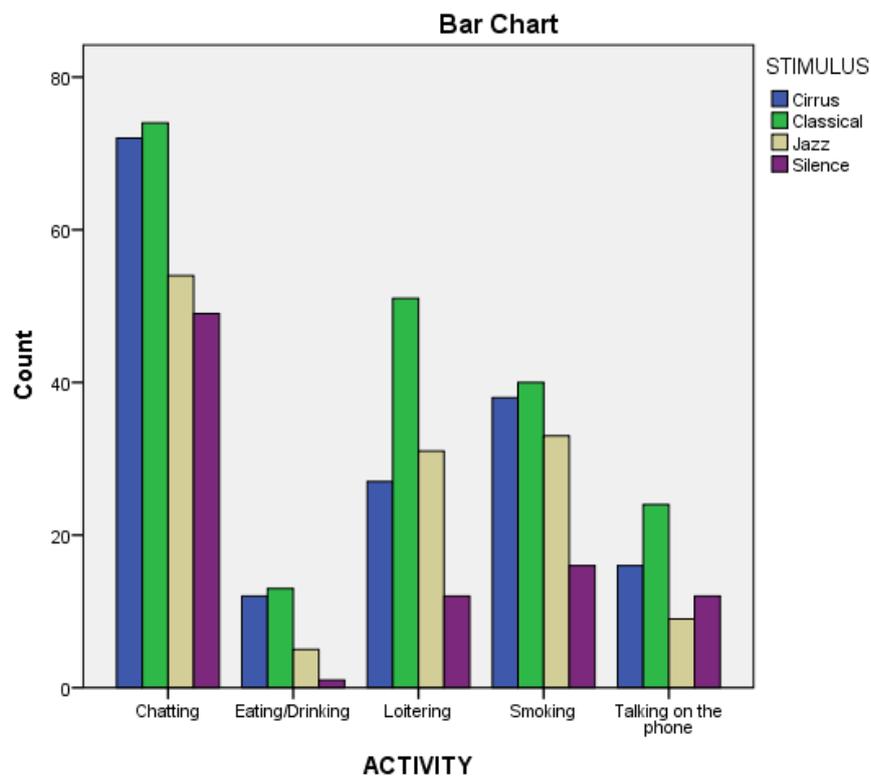


Figure 4 - Occurrence of specific activities' episodes according to the different music tracks and the silence condition.

3.3 Conclusions

Without any kind of intervention on the built environment, using only target strategies of sound environment manipulation, the ability of music to increase the attractiveness of a space and to trigger a set of activities was tested.

The results of the current study confirm that generally the presence of music and more specifically the classical music prolonged the duration of stay in the studied public space. Moreover, the analysis revealed that there is a correlation between the presence of different stimuli and the occurrence of some activities. A major number of loitering events was associated with the classical music together with higher numbers of chatting and eating/drinking events that have been reported

during the cirrus and classical music. Finally it was proved that the presence of music in general caused a major number of smoking events with respect to the silent condition.

These conclusions are indicative of the potentials of the soundscape approach in the management of public spaces based on its valuable capability of influencing the users' environment perception.

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