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The Influence of Background Music on Interactive Behaviour in an Indoor Space

Jiang, Jiani[1]
Key Laboratory of Cold Region Urban and Rural Human Settlement Environment Science and Technology, Ministry of Industry and Information Technology, School of Architecture, Harbin Institute of Technology, Harbin 150001
66 West Dazhi Street, Nan Gang District, Harbin, China

Li, Na[2]
School of Humanities, Social Sciences & Law, Harbin Institute of Technology
92 West Dazhi Street, Nan Gang District, Harbin, China

Meng, Qi[3]
Key Laboratory of Cold Region Urban and Rural Human Settlement Environment Science and Technology, Ministry of Industry and Information Technology, School of Architecture, Harbin Institute of Technology, Harbin 150001
66 West Dazhi Street, Nan Gang District, Harbin, China

Kang, Jian[4]
UCL Institute for Environmental Design and Engineering, University College London (UCL),
London WC1H 0NN, UK

[1]18S134156@stu.hit.edu.cn
[2]linabaobei@hotmail.com
[3]mengq@hit.edu.cn (corresponding author)
[4]j.kang@ucl. Ac

ABSTRACT

The research on the influence of indoor sound environments on human behaviour is limited at present. Therefore, the aim of this study is to examine the influence of music on interactive behaviour in indoor environments. This study used a laboratory experiment, with 40 participants, to consider five social relationship types: relatives/friends (RF), lovers (L), classmates/colleagues (CC), superior /subordinate (SS), and strangers (S). The results showed that in the with music condition, the scores for the degree of influence of noise sources on the conversation were between 0.5 and 6 points lower those in the without music condition. In addition, in the L group, the scores for the participants' interest in the conversation were 0.5 to 3.67 points higher. It also showed that music creates a more positive sound environment; positive scores were up to 7.5. This study suggest that music can be used to change the indoor sound environment and regulate people's interactive behaviour and dialogue quality.

Keywords： Indoor space; Background music; Interactive behaviour
I-INCE Classification of Subject Number: 61

1. INTRODUCTION

In many cultures, music is an important part of people's lives; it plays a key role in religion, celebrations, social activities, and cultural activities, and can satisfy the desire for aesthetic pleasure, entertainment, and social situations. The fields of music psychology, music therapy, and psychoacoustics have been derived from these responses to music. In the mid-19th century, the school of experimental psychology was devoted to the study of the relationship between music and sensation. For example, G.T. Fechner established a psychophysical method and conducted many experiments on acoustic intensity and sensory response. At the beginning of the 20th century, music psychology gradually became a separate field, focusing on the relationship between music and psychology specifically. Psychoacoustics researches the relationship between sound and its induced hearing, including complex sounds such as speech and music. Clearly, studying the effect of music on people's psychology and behaviour is considered significant.

Research indicates that people value music primarily because of the emotions it evokes. Several studies have suggested that the most common use of music is to influence emotions: people use music to change emotions, to release emotions, or to match their current emotions. Music is already used in several applications in society that presume its effectiveness for inducing emotions, such as film music, marketing, and therapy [1]. In terms of mental health therapies, music can stimulate positive emotions and reduce stress levels, which is conducive to reducing anxiety and stress in patients and medical staff [2]. In certain locations, music has different effects. For example, studies have found that, in open urban spaces, the sound of music can slow down the

public's walking speed and can play a part in crowd gathering [3]. One critical aspect of servicescapes is the soundscape of the environment. Using music to improve the overall atmosphere is a common method of enhancing the brand image. In a related study, supermarket shoppers said that music made shopping a more relaxing experience and that they would spend more time in a store when listening to music [4]. In another public space—the shopping mall—research indicates that background music can improve individuals' positive evaluations of the environment, facilitate approach behaviour, and enhance pleasure and dominance emotions, while foreground music can strongly increase arousal [5].

Music also has been shown to have different effects on a number of behaviours. In steady-state aerobic exercise, motivational music can reduce the perception of effort and fatigue by up to 12% [6]. In the process of work or study, listening to music has a different influence on people's concentration, according to their personality traits. The results of one study on this topic showed that listening to music was a distraction, and that extroverts were less affected by music than introverts [7]. However, there are differing opinions about the influence of music on studying. One study supports the Mozart effect, which claims that background music has a positive effect on study and cognitive abilities [8]. Another formulates the arousal-mood-hypothesis, which states that background music does not have a direct influence on cognitive abilities but affects it through the mediators of arousal and mood [8].

It can be seen that music has different effects in different locations and on different people and different behaviours, and there is still much space for research in the field of acoustics. However, the above-mentioned studies mainly focus on the influence of music on designated locations or groups, which lacks generalizability. Besides, in terms of the influence on behaviour, most research has focused on the individual level, and research at the level of social interactions is lacking. Therefore, this paper focuses on the influence of background music on social interactions during one-on-one conversations between people with different social relationships, in an indoor space.

2. METHODOLOGY

2.1 Case Site

As we expected that results from research in an indoor environment would be the most generalizable, an ordinary classroom (room 311) in the School of Architecture at the Harbin Institute of Technology was selected as the case site. The site is adjacent to a main road, as shown by the red dot in *Figure 1*. This building has a single-corridor layout, and the experiment classroom is located in the middle of this public corridor, and has one external wall and other classrooms to either side, as shown in *Figure 2*. On weekdays, there is a heavy flow of people through the public corridor, and human speech and footsteps can be heard frequently. The horizontal distance between the public elevator and the classroom door is about 30m, and the frequency at which the elevator bell can be heard is high. On the side next to the window, there is a public car

park outside. There is a small construction site about 50m from the experiment classroom (in a horizontal direction) and sometimes construction noise can be heard. The experimental site is rich in background sound sources, which is beneficial for the identification and evaluation of various noises in this experiment.

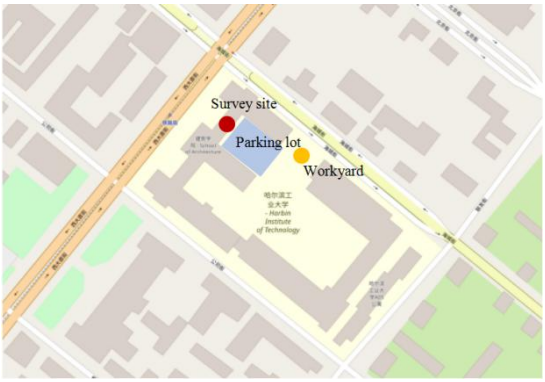

Figure1.The case study area

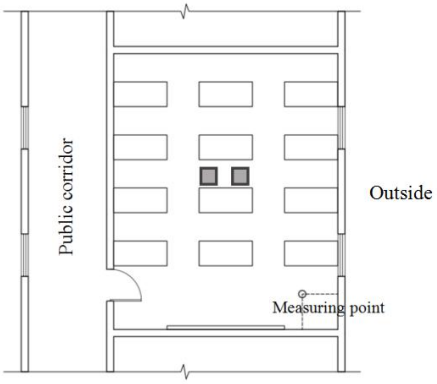

Figure2.Plan of the experimental room

2.2 Background Music Settings

Research shows that background music affects emotions: positive emotions promote positive behaviour, while negative emotions do the opposite.[8] In order to avoid the influence of music on subjects' emotions, the experiment chose neutral evaluative light music without lyrics as the background music, which was emitted using a loudspeaker. The tempo of the background music was between 97.5 and 129.7 bpm.

2.3 Measuring the Sound Environment

The duration of the experiment was from 2:00 p.m. to 5:00 p.m. on weekdays. Before the experiment, this study first recorded all of the noise sources in the case site. The main noise sources in the experiment classroom included: (A) door slamming, (B) footsteps, (C), speech, (D) music, (E) construction noise, (F) wind, (G) traffic outside, (H) the elevator bell, and (I) dragging of tables or chairs. The door of the classroom was kept open during the whole experiment. Subjects of each group sat at the specific locations marked in grey on Figure 2 and had a one-to-one conversation for 5 minutes. The acoustimeter was set-up at the test point shown in *Figure 2*, located in a corner at 1m from the wall on both sides and at a height of 1.2m from the ground.

The acoustimeter was used to multiple-measure the background sound pressure levels (SPL) for 5 minutes with no subjects, and under the without and with music conditions. The software SvanPC++ was used to analyse the recorded audio and the following data were obtained after summarizing: without subjects talking the average SPL was 43.1dBA (max = 65.9dB， min = 35.5dBA, SD = 4.0); without music the average SPL was 53.8dBA (max = 69.8dBA，min = 35.0dBA, SD = 3.9); with music the average SPL was 54.5dBA (max = 76.0 dBA, min = 10.1dBA, SD = 3.6).

2.4 Questionnaire survey

A total of 40 subjects participated in this experiment. After random pairwise allocation, subjects had one-to-one conversations with their respective partners, and they were divided into two conditions: with or without music. After completing a 5-minute experiment, subjects filled out an associated questionnaire.

Firstly, subjects were asked to record characteristics such as their gender, age, educational background, and occupation. Subjects were all undergraduate or graduate college students with different educational backgrounds. In the without music group, there were 4 males and 16 females aged between 19 and 25, with an average age of 23 (SD = 1.55). In the music group, there were 5 males and 15 females aged between 20 and 27, with an average age of 22.7 (SD = 1.58).

Secondly, the social relationships between subjects in each group were categorized into 5 relationship types: (1) relatives/friends (RF), (2) lovers (L), (3) classmates /colleagues (CC), (4) superior/subordinate relationship (SS), and (5) strangers. The distribution ratios of social relationship types among the 40 subjects are shown in *Figure3* and *Figure4*.

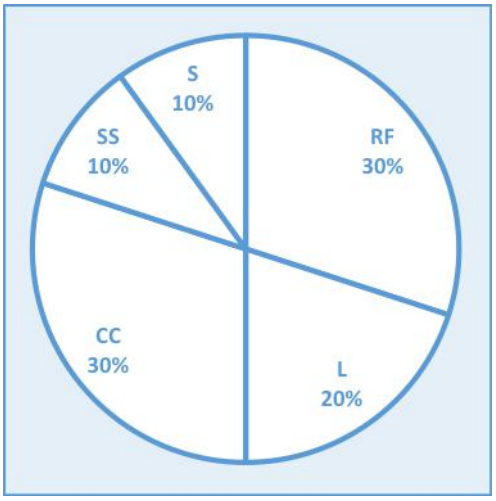

Figure3.Distribution ratio of social relationship types（without music group）

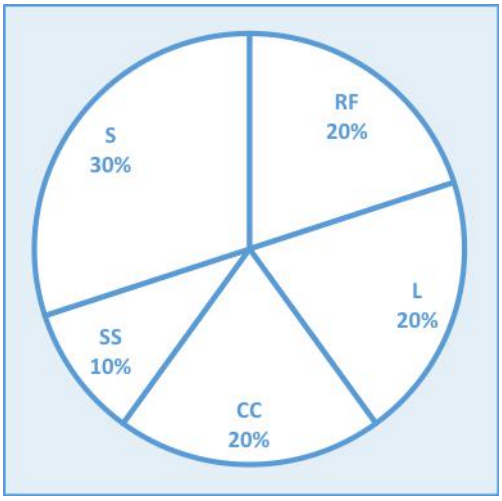

Figure4.Distribution ratio of social relationship types（with music group）

Thirdly, subjects rated the degree to which the music influenced the sound environment. Subjects were requested to list the noise sources heard during the conversation and rate the degree of their influence on a 10-point scale (not affected at all–very much affected; 1–10).

Then, subjects rated the degree to which the music affected their level of interest in the conversation. Subjects rated their level of interest on 10-point rating scale (not interested at all–very interested; 1–10).

Finally, subjects were asked to evaluate the general effect of the music on the conversation (positive/negative). Subjects rated the degree of this effect on a 10-point scale (not at all–very much; 1–10).

3. RESULTS

3.1 Effect of Music on Sound Environment

After the conversation, subjects used the questionnaire to report the noises they heard during the conversation and rated them according to their influence on the conversation (no influence at all–very influential; 1–10). Noises mainly included (A) door slamming, (B) footsteps, (C) speeches, (D) music, (E) construction noise, (F) wind (G), outside traffic, (H) elevator bell, and (I) dragging tables or chairs. By multiplying the average score of each noise source by the frequency at which the noise source was mentioned, a value reflecting the impact of each noise source on the conversation can be obtained. The degree of influence of each noise source on the conversation under the without and with music conditions in the RF, L, CC, SS, and S groups is shown in *Figures 5–9*, respectively.

Compared to the without music condition, the scores of the RF group were 0.33 points higher for door slamming and 0.5 to 2.33 points lower in other noise sources, and showed that the elevator bell had no effect on the conversation when background music was emitted. In group L, except for the score for door slamming which was 3 points higher, the scores for the other noise sources were all 0.5 to 3.5 points lower, suggesting that construction sounds and the sound of dragging tables or chairs did not have an impact on the conversation when music was being emitted. In the CC group, except for the score for speech sounds which was 1.5 points higher, the scores for the other noise sources were all 1.33 to 6 points lower. Other noise sources, including footsteps, did not affect the conversation when music was being emitted. In the SS group, all noise source scores were 1 to 4 points lower than in the without music condition, and outside traffic noise did not affect the conversation. In the S group, in addition to the door slamming and footsteps scores being 1.67 to 3.3 points higher than in the without music condition, other noise sources were 3 to 5 points lower, suggesting that the construction sound, outside traffic noise, and the dragging sound of tables or chairs had little impact on the conversation when background music was emitted.

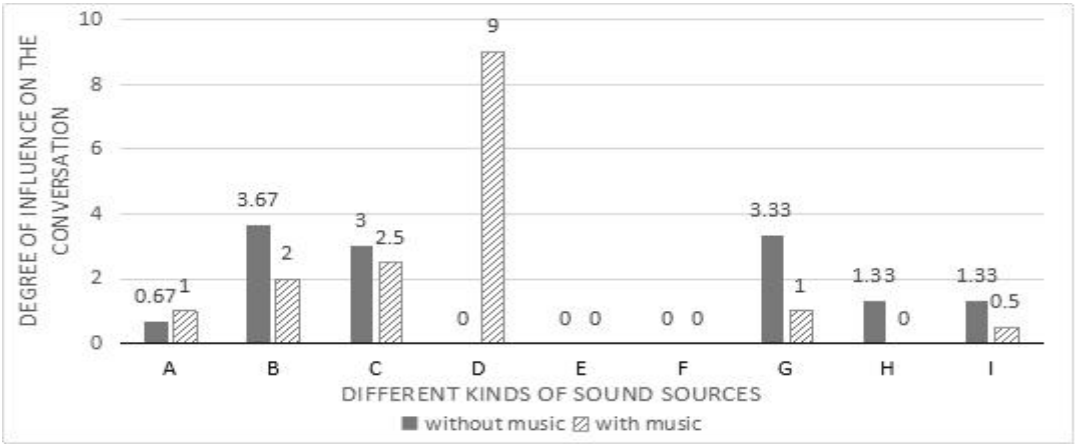

Figure5.Degree of influence of different noise sources on the conversations in RF group （without/with music）

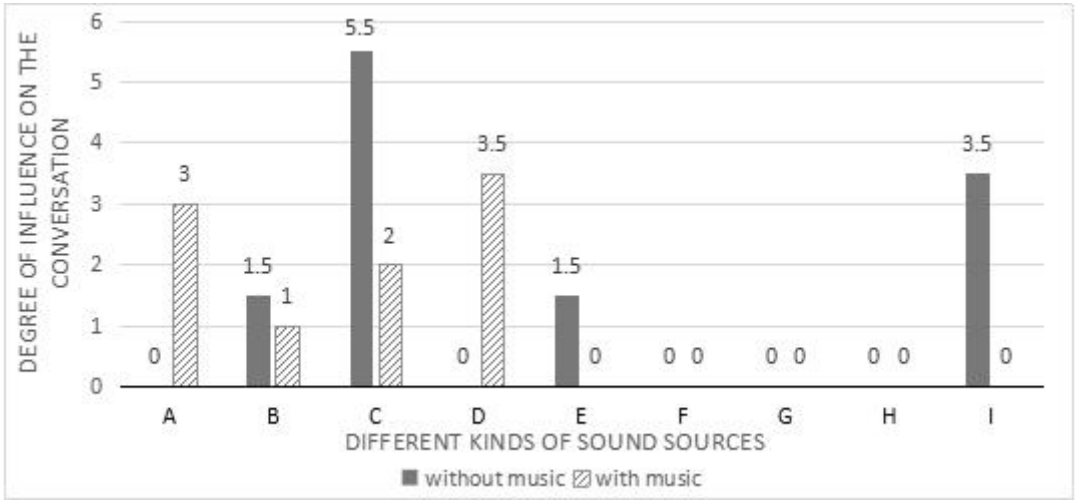

Figure6.Degree of influence of different noise sources on the conversations in L group（without/with music）

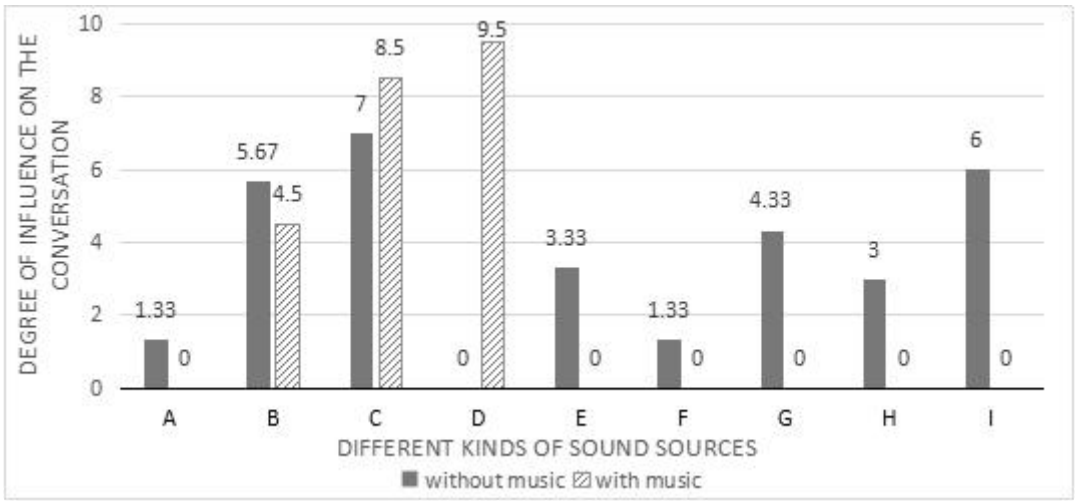

Figure7. Degree of influence of different noise sources on the conversations in CC group（without/with music）

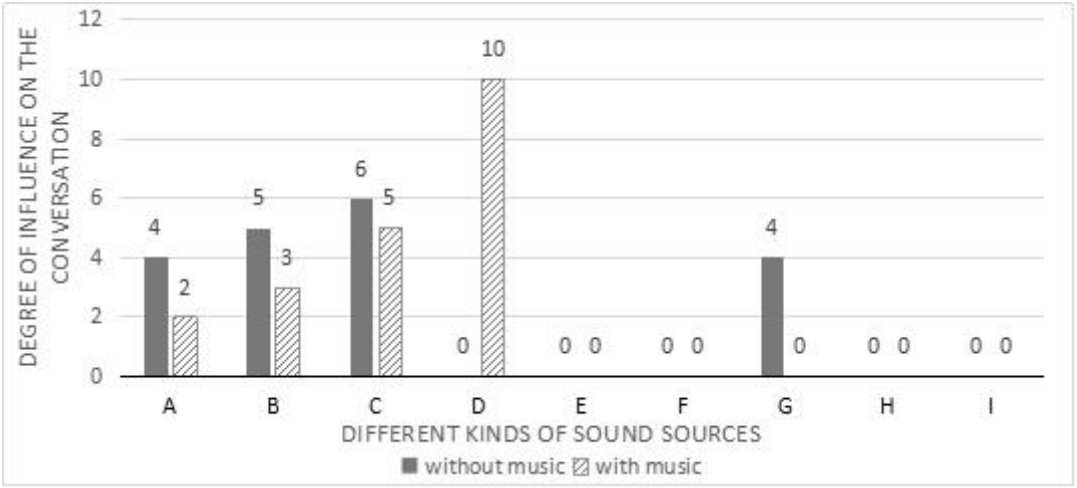

Figure8. Degree of influence of different noise sources on the conversations in SS group（without/with music）

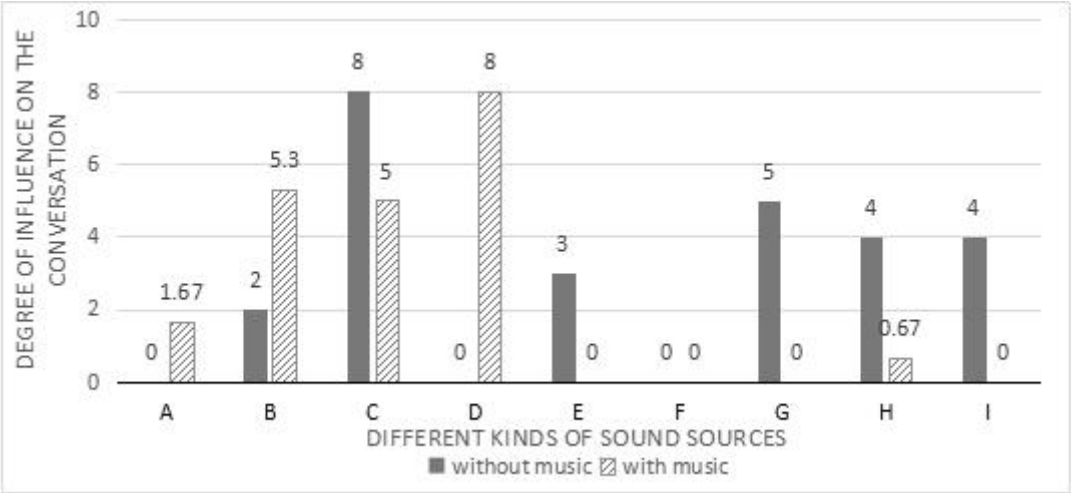

Figure9. Degree of influence of different noise sources on the conversations in S group（without/with music）

3.2 Effect of Music on the Level of Interest in the Conversation

Subjects rated their level of interest in the conversation on a 10-point scale (not interested at all–very much interested; 1–10). The average level of interest in the conversation of subjects according to social relationship type is shown in *Figure10*. Compared to the without music condition, the scores for all groups were all 0.5 to 3.67 points higher, except for that of the L group which was 4.25 points higher. One interesting result was that, after inquiries, we found that the low level of interest in the conversation among lovers was due to boring conversation content. It seems that sound environment is not the most influential factor on conversation for social relationships such as that between lovers.

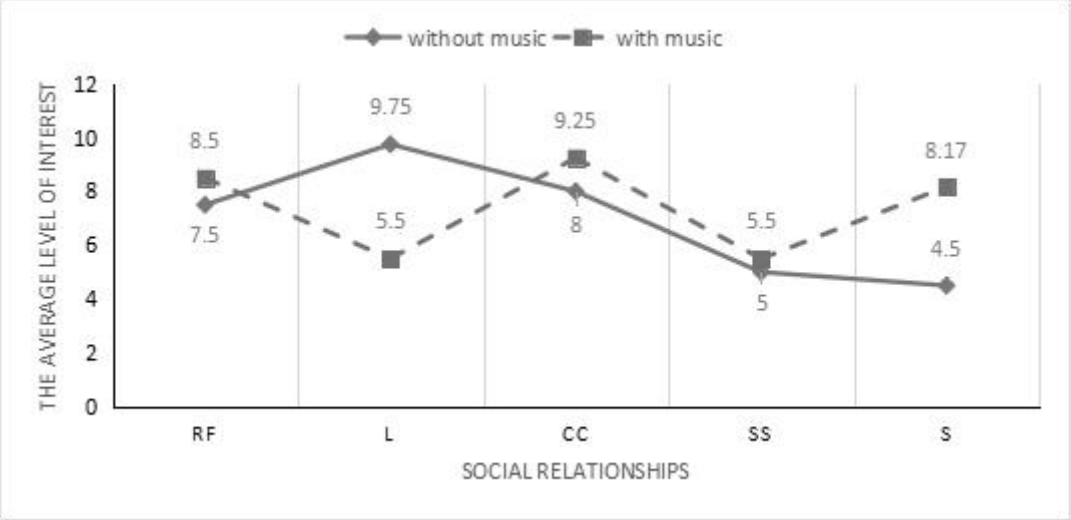

Figure10. The average level of interest of subjects in different social relationships（without/with music）

3.3 The Effect of Music on Conversation

Subjects evaluated the general effect of music on the conversation as positive or negative and graded the degree of this effect on a 10-point scale (unaffected–very much affected; 1–10). By multiplying the score of the positive/negative items by their frequency, a comprehensive score representing the overall effect of the sound environment on the conversation was obtained. The degree of general influence of the sound environment on the conversation in different social relationships in the without and with music conditions is shown in *Figures 11 and 12*, respectively.

In the without music condition, except for the SS group, the positive item score was 1 point higher than that of the negative item; the scores on the positive item in other social relationships were all 0.17 to 4.5 points higher than those of the negative item, among which only the S group reported a negative evaluation and the maximum score was 4.5. It was found that when the subject's conversation partner is their superior, occasional noises can better relieve the tension compared with an extremely quiet sound environment.

In the with music condition, except in the L group, the score of the negative item was 3 points higher than that on the positive item, the positive item scores among the other social relationships were all 4.83 to 7.5 points higher than those of the negative item, and there were no negative evaluations in RF, CC, and SS groups, among which the positive item scores were 5.5 to 7.5 points higher. It is obvious that the evaluation of the L group was different to that of the other groups. After investigation, it was found that the experiment site itself, the empty classroom with few people, made some subjects in the romantic relationship feel unnatural. Besides, the lack of suitable topics of conversation was the major reason for the low scores concerning effect of the overall acoustic environment. Some other couples pointed out that the sound environment had little effect on the conversation, and that they heard nothing other than what the other was saying.

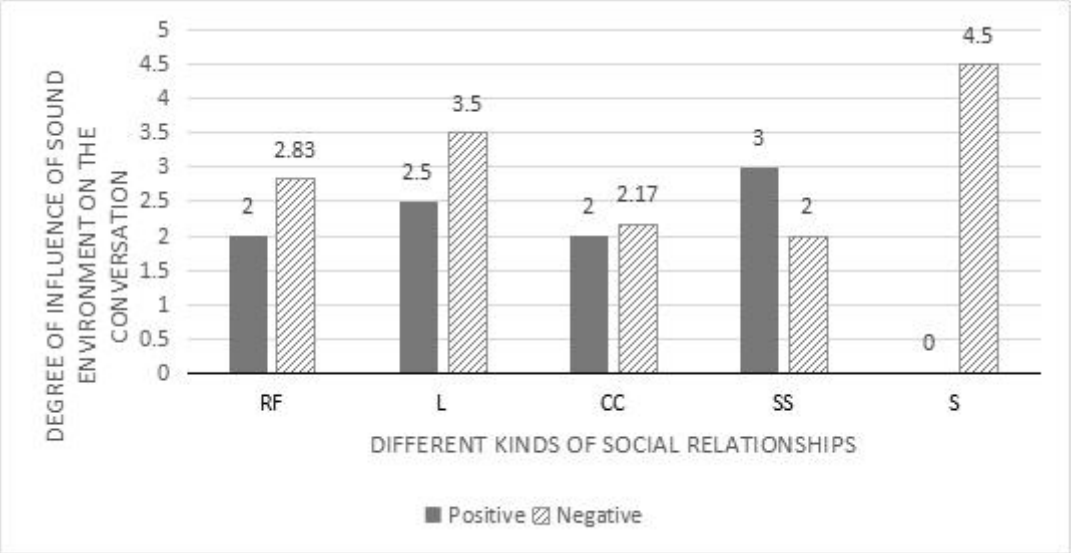

Figure11. Degree of general effect of sound environment on the conversations in different social relationships（without music）

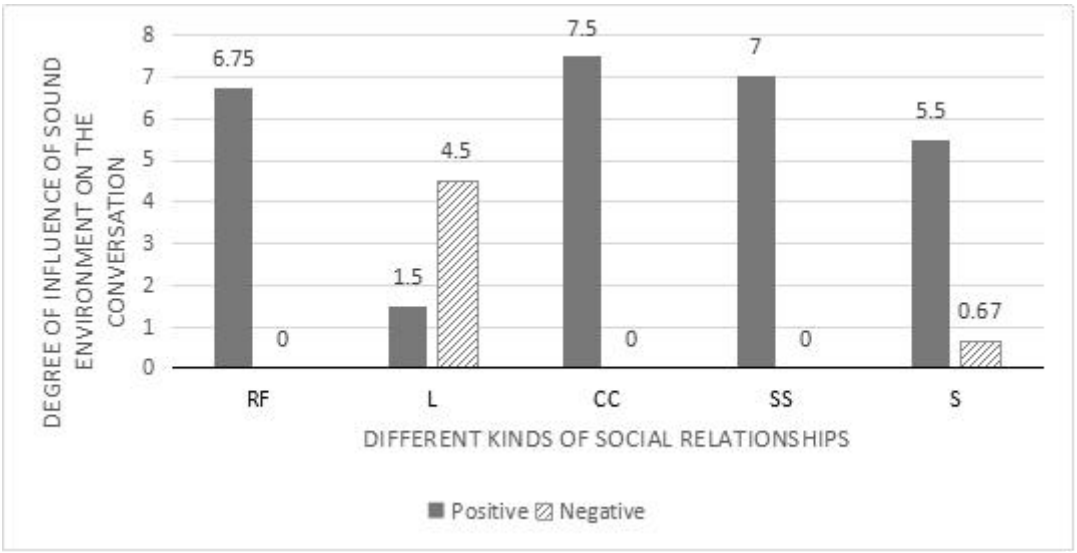

Figure12. Degree of general effect of sound environment on the conversations in different social relationships（without music）

4. CONCLUSIONS

Based on acoustic measurements and a questionnaire survey, this study analysed the effects of music on conversational interactions, based on 5 social relationship types. The conclusions are as follows:

When the sound environment contains music in addition to some specific noise sources (which will still affect the conversation), the degree of the effect on the conversation will be decreased or may even no longer have an effect. It shows that music, to a certain degree, has a masking effect on other noises. Due to the variation in the sensitivity of the individual subjects to certain noises, there is much left to understand about the degree to which specific noise sources affect conversation in the with music condition.

Compared to the without music condition, subjects in the with music condition show different degrees of increases in their level of interest in the conversation. However, for people in a romantic relationship, the conversation topic is much more important than the sound environment.

For all groups except the L group, music played a positive role in conversation. Specifically, for the majority of subjects in a superior/subordinate relationship, compared with an extremely quiet sound environment, no matter what kind of acoustic environment, noises can play a certain role in relieving tension. As for lovers, sound environment has little effect on the conversation: the site of the interaction and the topic of conversation plays a much more significant role.

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