Psycho – to – Building Acoustics: Are Bars, Café's and Restaurants Acceptable Acoustic Environments?

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Abstract

Are bar, café and restaurant environments actually too loud or considered acceptable from an occupants point-of-view? Can we actually predict how satisfactory such an occupant will perceive the acoustic conditions to their communication needs? The present study attempted to address these questions by comparing physical objective measures, wit h subjective ratings gathered in the field.

Findings from this study were both exciting and inconclusive simultaneously. A lack of significance between subjective factors themselves and a strong difference between how people rated each of the studied establishments disproved the concept that an index could be created for use in future predictions. The results highlighted the lack of relationship between objective measures and their ability to predict a subjectively acceptable acoustic environment. A strong argument was thus concluded as to the appropriateness of current standards for background noise, speech transmission indices (STIs) and speech levels for each of bar, café and restaurant environments.

Overall it was concluded that occupants generally find the current acoustic conditions acceptable in bars, cafes and restaurants, and that perhaps it is not these environments that need improvement, but that the current standards need to be re-evaluated.

Introduction

Have you ever been out socialising at a bar, café or restaurant and felt like you cannot even here yourself speak? What about the reverse? Have you ever experienced an environment so quiet that it is uncomfortable to be in and you feel like everyone can hear you? Well you are probably not wrong in your judgements and also most likely not alone. However, what constitutes good acoustic conditions for these social environments? Or, more importantly, what does the general population expect and accept as desirable conditions to be in, in a bar, café or restaurant?

The present study sought to address these questions by correlating what people in these environments want and perceive the acoustic levels as, with actual physical measurements of these environments. It was hoped that an index could be created from these variables, which could be used for future design and analysis of café, bar and restaurants relative acoustic environments.

Previous research has typically acknowledged that bars, cafes and restaurants produce less than desirable acoustic conditions for comfortable social interaction [3, 5, 7, 11, 12, 13]. That is, it has been found that the average noise level in restaurants and cafes is around 80dBA and can even reach up to 110dBA [2, 4, 7]. In comparison, the ear is most sensitive to speech for conversation purposes between 48-72dBA [10]. Consequently the recommended design (Noise Criteria – NC) sound level for bars, cafes and restaurants is 45-50dBA, 45-50dBA and 35-50dBA respectively [1, 9].

Acoustical comfort for the users is seen as crucial for their enjoyment and satisfaction of a space. It is defined as when activities can be undertaken without unwanted sound (noise) annoying other people, and has affects on both physiological and psychological well-being also [5, 12]. However, the large and varied number of subjective factors makes it hard to quantify this perceived comfort and determine it by objective methods [5].

Therefore, are bars, cafes and restaurants producing unsatisfactory objective acoustic conditions in terms of standards and ratings (that is, background sound level and speech transmission index). If so, how are these conditions experienced and perceived by the people subjected to them?

Overall, the aim of this research is to see if cafes, bars and restaurants are actually too loud or acceptable acoustic environments for their occupants. However, can we actually and accurately predict how people will rate or perceive these acoustic environments?

Methods

The current study measured both objective and subjective parameters of the chosen acoustic environments. This was done primarily to establish if any relationships exist, but also because past research has identified that discrepancies exist between physical and subjective acoustics [8]. That is, it appears that it is possible that measurements and criteria for noise may disregard individual's personal reactions and associated meanings from them [9].

Population Studied

Venues were selected randomly and invited to co-operate in the study. Four environments for each of bars and cafés, and three fitting the restaurant criteria were studied. Note that this was due to reluctant participation and time constraints. (Refer 5 for definitions of a bar, café and restaurant environment.)

The sampling frame for subjective measurements was occupants of these environments, and ranged from customers to staff and management. 20 people were surveyed in each location and again were approached at random. Participation was entirely voluntary and anonymous. This random selection of participants and venues was seen as the best method to obtain a representative sample of the population in the Wellington CBD area.

Subjective Measurements

Occupant's subjective appreciation of their environment at the time was measured through a series of questions in a survey. (A copy of the survey distributed is attached as Appendix A.) This survey was developed from similar previous questionnaires and was aimed to address issues relating to perceived acceptability or annoyance of the acoustic environment, relative degree of effort needed to communicate comfortably, and subjects personal level of noise sensitivity. (Refer to 5 for further information.) General questions relating to occupants hearing capabilities, frequency to such environments, perception of dominant noise sources, and preference of listening conditions and environments were also addressed.

Objective Measurements

Various physical measurements were taken in each of the environments, to establish the background noise levels and frequency distributions, and the speech transmission index (STI) ratings for each of normal, raised, loud and shouting speech levels. These STI ratings are dependent upon the background noise levels, reverberation time (RT) and a defined speech level for each STI condition at 1/3 octave centre frequencies.

Background noise levels were calculated from a calibrated recording of the acoustic environments at the time of the surveys. RT measurements were performed at a later time when the venues were empty. This was done using a loudspeaker generating a broad band maximum length sequence (MLS) to an omni-directional microphone set-up. This was performed four times for each, and the average RT used in the final STI calculation. The speech level (SPL) used for each 1/3 octave centre frequency was from a pre-defined standard from the American National Standards Institute (ANSI) 53.5 (1997) (see Appendix H).

These three parameters above were input into winMLS acoustical analysis software. This software then generated an average STI rating for each environment for each of the four speech levels as stated above.

Assumptions

A number of issues, and hence assumptions and justifications, were made in order to carry out these measurements. For example, there were a range of options available to assess speech intelligibility. The STI method was chosen however because of its best suitability to the bar, café and restaurant environments and access to equipment [refer to 5].

An assumption had to be made as to the appropriate distance between speaker and microphone to approximate the average speaker to listener distance. This was consequently justified to be a single table width apart, approximately 700-800mm.

Another issue relating to the measurement of the RT was that realistically it could not be done as preferred while occupants were enjoying their meal/drink as the noise produced could be particularly interruptive. Hence, RT's were done when unoccupied and it was assumed that the absorption from occupants was relatively minimal.

It was also assumed that a representative sample of the general population would be attained through the random selection of places and people.

obtained

Data-Analysis

Data was analysed using the SPSS version 11.5 statistical software package. A factor analysis was performed on the survey questions for each category individually and with all three (that is, the whole data-set) together. Appendix B presents the results of these factor analyses.

The aim of this was to remove inconsistent data, and establish groupings of questions that could be considered to combine to a single factor or variable representing part of the overall subjective interpretation of the acoustic environment. In this way, the dimensions that may be important for an acoustic index could be identified. These questions were combined to a single number according to the weightings given to each from the factor analysis. A question was considered to be a significant contributor to a factor if its correlation was greater than 0.5.

It was found that the number of factors, the strongest correlating questions for each factor, and the order of these similar factors varied between the four data groups (see Appendix B). For example, the main factor explaining 17.1% of the variance in bars was related to participant's noise or environmental awareness, where as for cafes and restaurants the main factor was the degree of effort required for communication, explaining 16.8% and 22.1% of the total variance respectively.

This implied then that analysis of the three different categories (bars, cafes and restaurants) together was inappropriate. That is, variables between each environment were rated and grouped on different levels of importance. This also meant that an index for predicting occupant's acceptability of an acoustic

environment was not applicable, as results seemed to differ for the different environments.

Therefore, all further analyses were made separately and based on the particular factors important to each of the three environments as listed in Appendix B.

Results

Descriptive Statistics

Descriptive statistics were calculated to describe the basic features of the acoustic environments and the social characteristics of the surveyed population.

Social Characteristics of Sample

The age and sex of the occupants in all the venues combined for each category of bars, restaurants and cafes is shown in tables 1, 2, and 3. In addition, appendix C presents each of these venues separately. It can be seen that the majority of people who frequent bars are in the younger age groups, particularly ≤25 (47%). People in the 25 -35 years category represented the largest population to visit both cafés (42%) and restaurants (53%). However, a comparison of the means shows that there is really no significant age difference between people who frequent each environment. That is, all are situated around the late 20's early 30's being 28, 34, and 27 for bars, cafes and restaurants respectively.

No significant differences in sex were found between each of the three environments also.

sex of a bar is different than?

Table 1. Bars Overall

Age	Male		Female		Total	
	No.	%	No.	%	No.	%
≤25	8	22	26	70	34	47
25-35	14	39	7	19	21	29
36-45	12	33	2	5	14	19
46-60	2	6	2	5	4	5
≥60	0	0	0	0	0	0
Total	36	49	37	51	73	100

Average: 28

Table 2. Cafes Overall

Age	Male		Female		Total	
	No.	%	No.	%	No.	%
≤25	6	17	13	30	19	24
25-35	15	42	18	42	33	42
36-45	6	17	9	21	15	19
46-60	6	17	2	5	8	10
≥60	3	8	1	2	4	5
Total	36	46	43	54	79	100

Average: 34

Table 3. Restaurants Overall

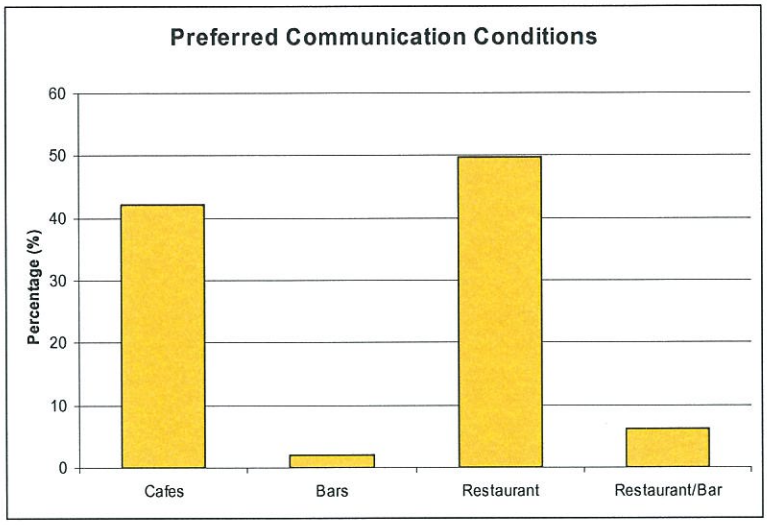
Age	Male		Female		Total	
	No.	%	No.	%	No.	%
≤25	7	24	8	29	15	26
25-35	16	55	14	50	30	53
36-45	6	21	6	21	12	21
46-60	0	0	0	0	0	0
≥60	0	0	0	0	0	0
Total	29	51	28	49	57	100

Average: 27

Preferred Environment for Communication

The most preferred environment to support inter-personal communication is illustrated in Figure 1.

Figure 1: Preference ratings for communication.

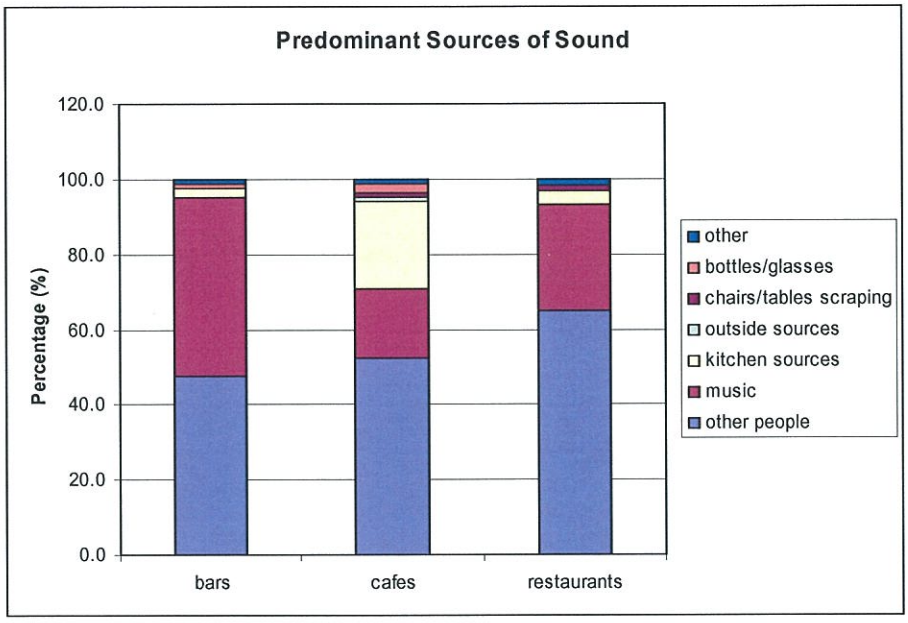


Restaurants are clearly desired to be the most supportive conditions allowing for communication. This is reasonable allowing for the fact that people go to these environments to hold conversations with one another.

Predominant Sources of Sound

The greatest noise source was other people in restaurant environments. This is illustrated in figure 2 and appendix D. On the whole, sounds from other occupants were rated as the most predominant noise sources in all three environments. This provides evidence for the suggestion that major source of annoyance to social interaction, is in fact others conversations. Therefore, how is this problem overcome when the cause is the thing desired to achieve?

Figure 2: Distribution of Sound Sources in Each of the Environments.



Background Noise Levels

Figures 3 and 4 present the average background noise levels and frequency spectrums for each of the different venues. Appendix E presents these graphs and the tabulated data also.

Figure 3: Average Background Noise Levels occurring in each Venue.

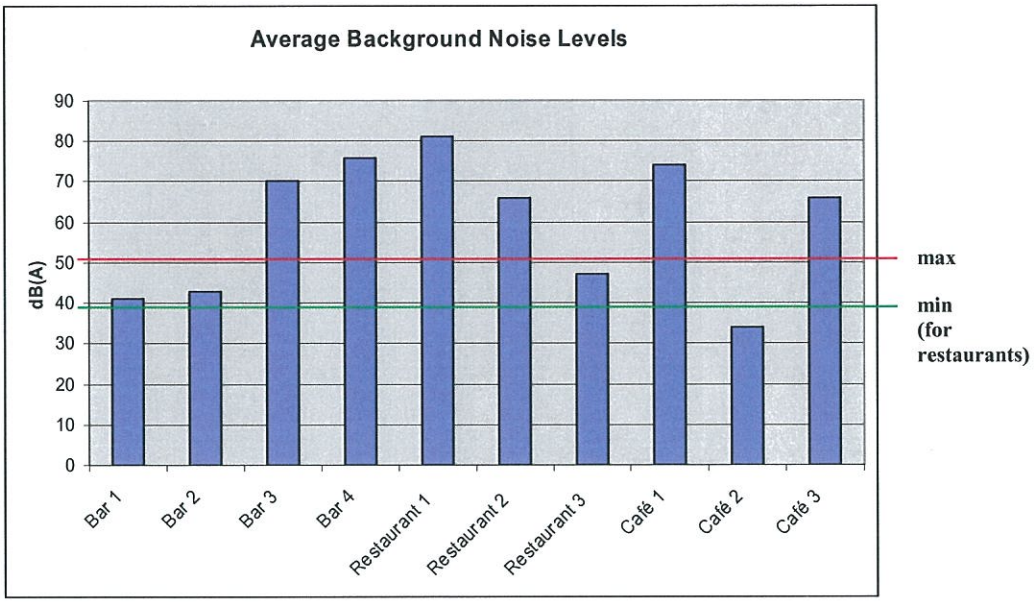
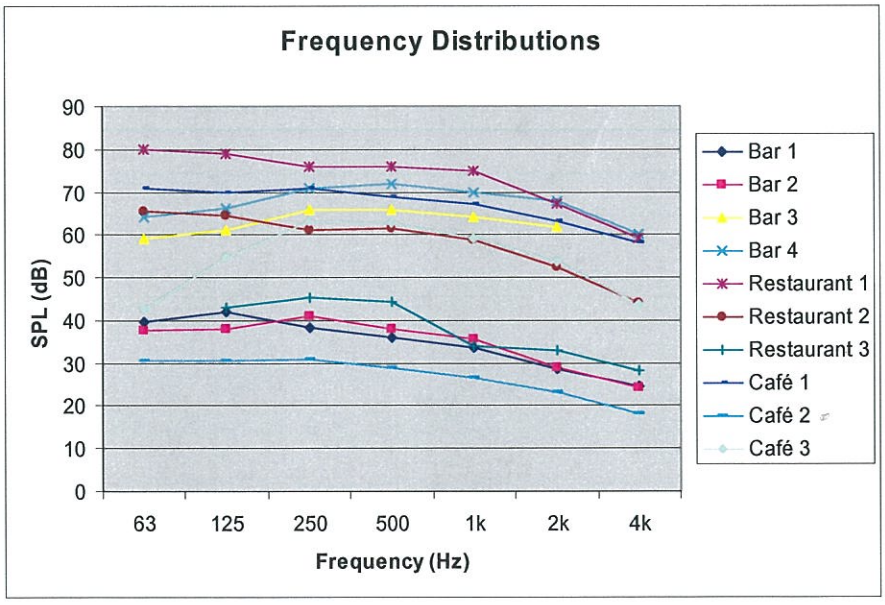


Figure 4: Frequency Spectrums for each Venue.



TWO GROUPS BY NOISE LEVEL BUT NOT FUNCTION

The maximum level recorded was 81dBA at restaurant 1 which is well above the recommended design sound level of 50dBA [1, 9]. (80dBA is also seen as the critical point at which after this level acoustical comfort deteriorates in a 'noise-breeds-noise' effect [5, 11].) Even more, 60% of the places were above this standard, which provides direct evidence and support for the statement that bars, cafes and restaurants in objective terms provide less than desirable inter-communicative conditions.

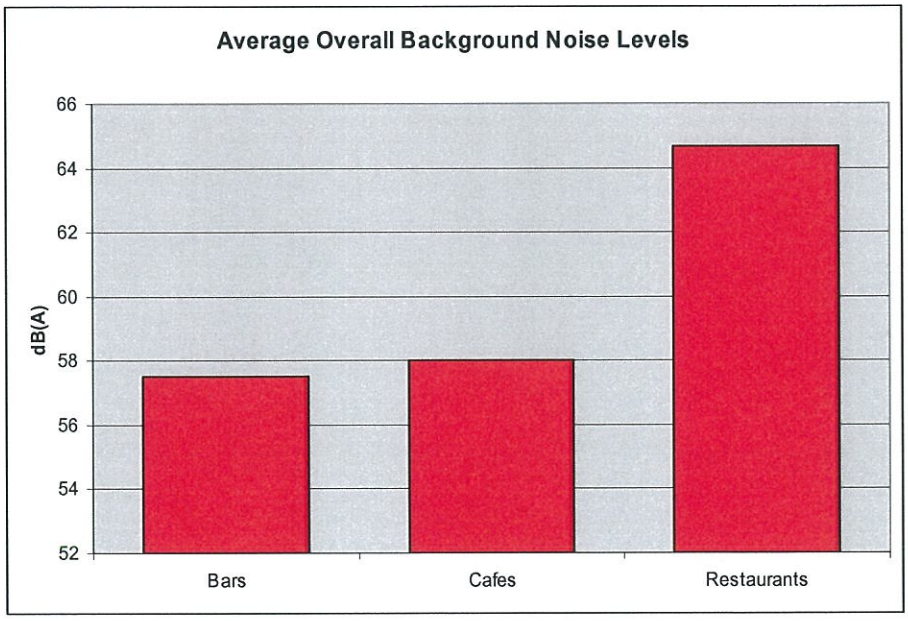
Conversely, the lowest background noise level was 34dBA in café 2. This could also be seen as a less desirable environment, as a low noise floor can be unsupportive to conversation and quite psychologically disturbing. Namely, people will often feel uncomfortable and without sufficient speech privacy.

Two of the bars also had very low background noise levels which is quite unexpected, as bars generally in the past have been considered to be 'noisy' environments. This perception is also often a critical factor to their atmosphere and success.

If these standards are taken as guidelines for acoustically supportive environments, then only one out of the sample meets these requirements (restaurant 3). (Refer to figure 3.)

Overall, restaurants had the highest background noise levels at 65dBA, with bars and cafes being 57.5dBA and 58dBA as highlighted in figure 5.

Figure 5: Overall Average dB(A) Levels.



STI ratings

Speech Transmission Indices (STI's) for each venue at each speech level are presented in Figure 6 below. An STI close to 1.0 is considered excellent intelligibility, and closer to 0.0 is seen as bad or poor speech intelligibility conditions.

Figure 6: STI's for each Level and Venue.

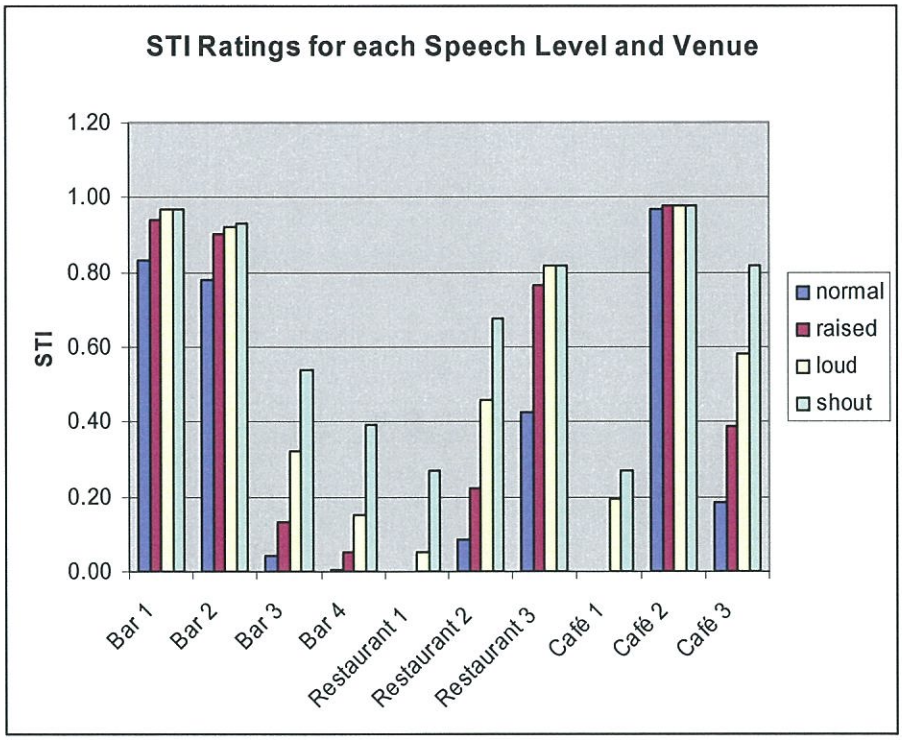


Table 4 shows the average STIs for each of the different environments overall. That is, restaurants on the whole had the poorest speech intelligibility conditions over all the four levels.

Table 4: Overall STIs for each Different Type of Environment.

	normal	raised	loud	shout	Average
Bars	0.41	0.51	0.59	0.71	**0.55**
Cafes	0.58	0.45	0.58	0.69	**0.58**
Restaurants	0.17	0.33	0.44	0.59	**0.38**

Comparison of Means

This section is odd without the question listed ... Where is the data?

A comparison of the overall average for bars, cafes and restaurants for each question presented some interesting findings. Table 5 below presents these averages with their variance (as a percentage) from the group mean of all three environments.

Table 5: Overall STIs for each Different Type of Environment.

	Bars	Restaurants	Cafés	Bars	Restaurants	Cafés
Question		***Average***			***Percentage (%)***	
1	3	1.84	1.91	*33.3*	*-1.9*	*0.0*
2	3.29	3.21	3.16	*2.2*	*-0.4*	*-1.8*
3	2.21	2.37	2.2	*-2.21*	*0.0*	*0.0*
4	2.73	3.04	2.94	*-6.1*	*4.8*	*1.3*
5	2.41	2.32	2.38	*1.8*	*-2.1*	*0.3*
6	2.73	2.98	2.90	*-5.0*	*4.0*	*1.1*
7	2.68	3.02	2.93	*-6.9*	*5.0*	*1.8*
8	2.30	1.93	1.86	*13.4*	*-4.9*	*-8.5*
9	4.03	3.97	4.07	*0.2*	*-1.3*	*1.1*
10	2.96	2.67	2.59	*8.1*	*-2.6*	*-5.5*
11	2.37	2.31	2.07	*5.4*	*2.5*	*-7.9*
12	2.25	2.30	2.17	*0.4*	*2.6*	*-3.0*
13	2.96	2.67	2.68	*6.9*	*-3.8*	*-3.2*
14	2.50	2.45	2.38	*2.4*	*0.2*	*-2.6*
15	0.99	0.71	0.84	*13.7*	*-6.5*	*43.0*
16	2.15	1.96	2.22	*4.0*	*-12.8*	*53.4*
17	2.85	2.55	2.58	*18.7*	*-1.7*	*36.8*
18	2.10	1.87	2.00	*5.3*	*-5.9*	*0.6*
19	2.65	2.54	2.19	*19.1*	*17.6*	*26.9*
20	2.86	2.81	2.25	*8.2*	*6.6*	*-14.8*
21	2.33	2.38	2.43	*-4.6*	*-2.1*	*54.5*
22	2.11	2.21	2.26	*-3.9*	*0.7*	*3.2*

It can be interpreted from these findings that speech intelligibility is considered most important to people in café environments (Q.9). This is followed by bars and finally restaurants. This result may suggest that cafes produce the least communicative conditions of the three, which in turn would make people more aware of their need for better conditions and hence subconsciously affect their rating of intelligibility. Interestingly however, acoustic awareness was not a significant factor for café's as demonstrated in the factor analysis before (appendix B), and

before this?

overall, cafes were not the worst performing in terms of background sound level and STI's.

It can also be inferred from these comparisons that people in bars are generally less concerned about noise and speech conditions than people in cafes and restaurants. Alternatively, this could be interpreted as people who frequent restaurants prefer and expect less noise (Q. 1, 3, 4).

The statement could also be made from these results that the type of people who frequent bars are less noise-sensitive, preferring and finding it easier to relax in louder as compared to quieter conditions (Q. 2, 7, 8).

Degree of effort, or the effort required to merely hear and be heard [5, 9], is required significantly more in bars than in restaurants and cafes. This is illustrated in the percent of variance from the group mean for questions 10, 11 and 13. In particular, difficulty seems to occur in hearing other people. What is surprising is that bars had the lowest background noise levels on average, which contradicts the assumption that higher noise levels require more effort to compete with.

Question 12 however demonstrates that people in restaurants typically find it more difficult to be heard (as compared to hearing). A possible reason for this could be because of the different emphasis or importance people put on being heard and hearing in different environments. For example, in restaurants it could be considered more of a necessity to be heard by the waiter and the person(s) communicating to. This is because it is more likely that what is being said in this kind of environment is more important and meaningful than say when socialising in a relaxed bar environment.

In restaurants also, occupants are generally more conscious of other diners and the noises they are generating (Q. 6) compared with bars and cafes. This is also supported by previous findings that the most predominant and annoying source of sound are other people in restaurants (refer to figure 2). People in bars however from the other viewpoint, are les concerned and aware of others conversations. This finding helps confirm the postulation that in restaurants people want and expect more private and intimate environments, particularly so that a reasonable conversation can be carried out comfortably. Is this due to people adapting to what they want from these particular environments, or is this due to a heightened

awareness from the particular type of people who frequent restaurants. It could also be that people in restaurants are more sensitive to noise and perhaps not as likely to frequent bars. This could be supported by question 4.

Inferential Statistics

Pearson Product Moment Correlations (r) were calculated between various parameters and scales for inferential statistics. A significance level of 5% was used for all statistical analyses.

Correlations between Main Subjective Factors

Correlations were run between the main factors as identified previously (appendix B) for each of the three types of environments. These results are presented in Appendix G.1. This was performed mainly for the overall aim, to construct an index to predict the quality of the acoustic environment from subjective ratings or factors. That is, what weightings of each would be necessary so as to gather how acceptable any general person would consider the acoustic conditions to their needs? Tables 6, 7, and 8 below show the relationship of each factor to acceptability. (Note that not all of these are significant.)

It was found however that these factors altogether did not predict an occupant's acceptance of an environment very well. That is, for bars the factors altogether only accounted for 66.1% of acceptability. Similarly, the combined factors for cafes only represented 50.6%, and 33.1% for restaurants.

Table 6: Factor Weightings for Cafes

Pearson Correlation (r)	Acceptability
Degree or Effort	.391
Perceived Noise Level	.331
Noise Sensitivity	.291
Combined (R)	**.506**
R Square	**.256**

Table 7: Factor Weightings for Restaurants

Pearson Correlation (r)	Acceptability
Privacy	.261
Noise Sensitivity	.197
Environmental Awareness	.168
Degree or Effort	.065
Combined (R)	**.331**
R Square	**.110**

Table 8: Factor Weightings for Bars

Pearson Correlation (r)	Acceptability
Degree or Effort	.622
Environmental Awareness	.397
Perceived Noise Level	.335
Noise Sensitivity	.316
Privacy	.299
Control	.219
Combined (R)	**.661**
R Square	**.437**

It should be noted that acceptability throughout this study and results, was rated as 1 – "very acceptable" to 5- "not at all acceptable" so in fact these correlations are all negative relationships. That is for example, as perceived noise level increases, acceptability decreases.

Statistically significant positive relationships were found for people frequenting bars between acceptability and degree of effort ($r(79) = .622$, $p < .05$), and noise level and degree of effort ($r(79) = .587$, $p < .05$). These two results show that as the noise level increases so do the subsequent levels of effort needed to communicate. With this increase in effort, a person's acceptance or enjoyment of the space decreases.

Environmental awareness was significantly related to noise sensitivity ($r(79) = .633$, $p < .05$), inferring that the more noise sensitive a person is, the more aware they are of their surrounding acoustic environments.

Environmental awareness was also significantly related (although somewhat weakly) to degree of effort ($r(79) = .397$, $p < .05$) and perceived noise level ($r(79) = .414$, $p < .05$). These positive relationships suggest that a person will also be more aware of their acoustic surroundings as the level of noise and thus effort increases.

Cafes on the other hand had no moderate to strong relationships existing between the main factors (see appendix G.1). While some were significant, most were too weak to be concerned about. The only one worth reporting was between degree of effort and acceptability ($r(76) = .391$, $p<.05$). Again as for bars, this suggests that the more effort one puts into communicating, the less acceptable the acoustic surroundings are perceived as.

In comparison, two moderate relationships were found for the main factors in the restaurant responses. They were between environmental awareness and degree of effort ($r(58) = .526$, $p<.05$), and environmental awareness and noise sensitivity ($r(58) = .433$, $p<.05$). These imply that one is less aware of the surrounding acoustic conditions with the less effort they must exert to hear and be heard, or the less noise sensitive they are to 'noisy' environments.

Correlations between Objective Measures and Subjective Factors

Objective measures (that is, background noise levels and STI's) of the physical acoustic environment were correlated with subjective ratings of acceptability for each of the three environments. Appendix G.2 documents all the following correlations results.

Acceptability was found to be significant to background noise levels only in restaurants ($r(59) = -.228$, $p<.05$). This negative relationship either suggests that background noise levels are more important or influencing in peoples ratings of acceptable acoustic conditions in restaurants compared with the other two categories, or it could be a direct reflection of the louder background levels measured in restaurants. All things considered this is a very weak relationship and this combined with the other insignificant findings suggests that the relative background noise level is not a significant factor predicting an occupant's satisfaction with an acoustic environment.

Correlations were performed between acceptability and the STI levels in each environment. Only two very weak significant relationships were found, again in restaurant conditions. That is, ratings of acceptability were related to a normal speech transmission level ($r(59) = .262$, $p<.05$) and raised speaking levels ($r(59) = .252$, $p<.05$). This suggests that speech intelligibility is most likely more important in restaurants, especially at the normal and raised speech levels where one is likely or expecting to be talking. That is to say, it is generally considered not socially acceptable to be shouting in a restaurant environment.

It could be inferred from these results then that STI is not really a good predictor of how people might rate an acoustic environment for socialising.

No significant relationships were demonstrated between any of the other main subjective factors and the STI levels for all three environments of bars, cafes and restaurants.

Question 13, which asked directly if noise was impairing the subject's conversations at all, was correlated against STI levels. No relationships again were found at the 5% significance level for cafes and bars. These extremely weak relationships imply that people are most likely talking in a louder voice or increasing their listening efforts than assumed in the STI conclusions.

Restaurants on the other hand did yield significant relationships although relatively weak. An STI at a raised level was weaker in relationship to impairment of conversation ($r(58) = .222$, $p<.05$) compared to a loud level ($r(58) = .311$, $p<.05$) and shouting ($r(58) = .368$, $p<.05$). It can be implied that the higher voice level one must use to account for the physical acoustic conditions, the more ones conversations are impaired. Note that these relationships get stronger as the level of STI drops (that is, high speaking level).

STI's plotted against the background noise levels produced very significant negative relationships. Figures 7, 8, and 9 show these for bars, cafes and restaurants.

Figure 7: Bars

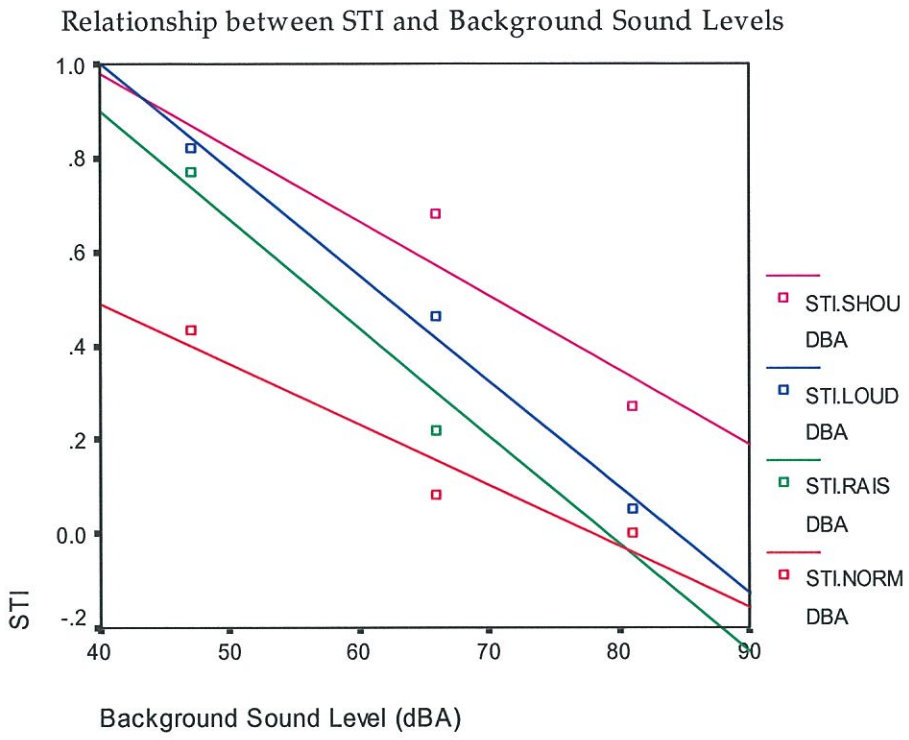


Figure 8: Cafes

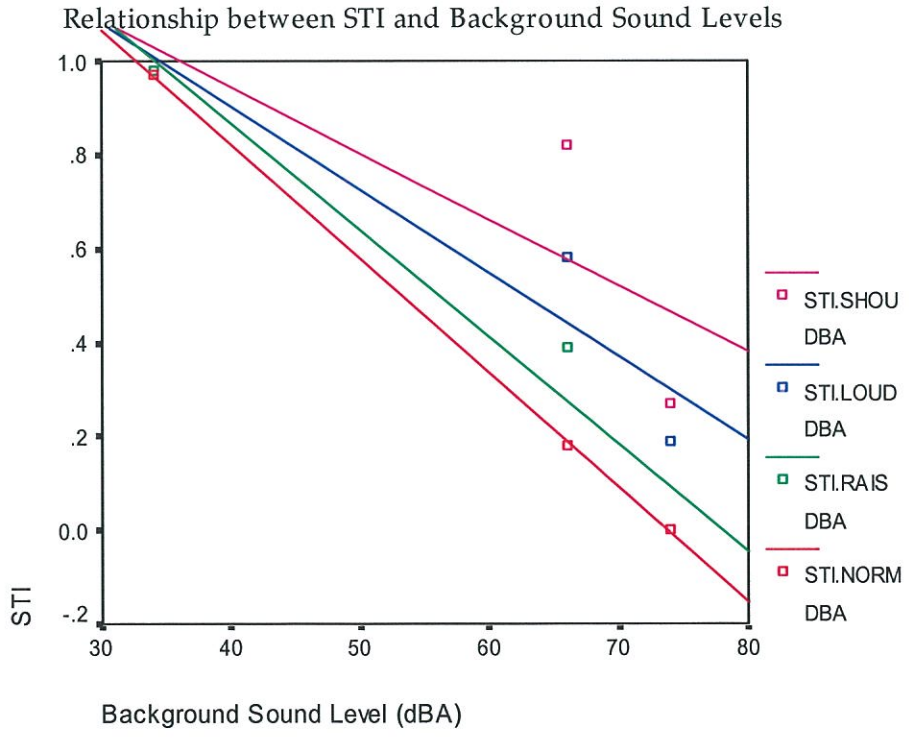
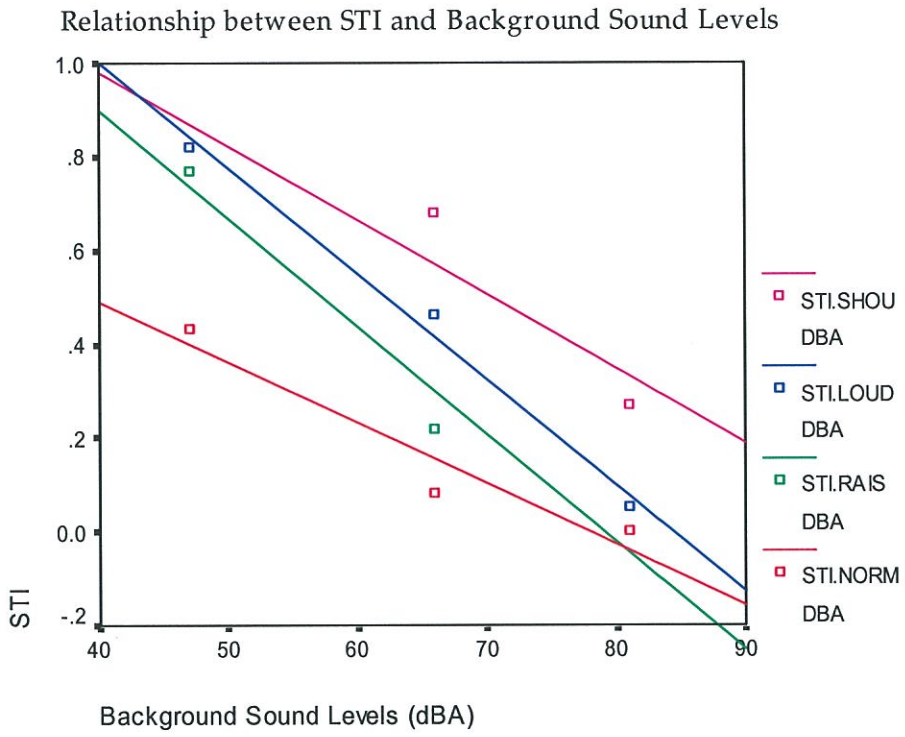


Figure 9: Restaurants



This directly shows that as the dBA level increases, the STIs drop to less desirable levels for each of the four relative voice levels. That is, STI's and speech levels are strongly dependent on the background noise levels occurring.

Appendix G.2 presents these significant correlations. Because of the strong relationships, these plots above could thus be used in future experiments to predict the STI's of a bar, café or restaurant environment based with only the knowledge of the average background noise levels of a venue.

An interesting finding here was that the correlations for bars and restaurants were the same, but cafes produced different weightings in the relationship.

Demographic Correlations

Correlations were performed with the demographic variables of age and sex to see the potential effects that these variables could have on such factors of acceptability and perceived noise levels.

None of the analyses for age yielded significant effects. Thus it appeared that within the limits imposed by the demographic characteristics of occupants at bars, cafes and restaurants, perceived acceptability and noise levels were similar regardless of their age.

Significant relationships were found however between sex and acceptability ($r(213) = -.139$, $p<.05$) and perceived noise level ($r(213) = .152$, $p<.05$). While these are weak, they suggest that females are more likely to rate an environment more acceptable and with lower noise levels compared to males. Appendix G.3 documents these findings.

Hearing ability of the occupants was found to have a significant relationship to degree of effort, but only in bars ($r(77) = .218$, $p<.05$) and restaurants ($r(57) = .223$, $p<.05$). That is, the greater hearing impairment a person has the more effort they feel they have to apply in these two acoustic environments. Possible reasons for this not occurring in cafes, is the higher background levels found in restaurants and the greater number of people with hearing difficulties (that is, 53% of total cases) that were found in bars. That is, it was found that a number of staff or previous staff complained about hearing impairments as a result of long periods of exposure to loud music.

Discussion

It is agreed that bars, restaurants and cafes, do not produce suitable levels of acoustic support for social interaction [5, 11]. Values recorded in this study predominantly support this statement. That is, background noise levels recorded were well above the recommended standards [1]. While this is considered unacceptable in this respect, it should also be noted that these levels do not breach health and safety levels (90dB for an 8-hour day) and ~~pose as hazardous~~ to occupants and staff [4].

thus do not pose a hazard ?

In particular, restaurants provided the worst conditions in terms of background noise levels and STI ratings. This is concerning as people preferred restaurants as the most important of the three environments to have good acoustic conditions to support communication. However, it should be taken into account that the small number of venues studied (that is, 3) places limitations on our results and conclusions.

Correlations between subjective factors highlighted various relationships for each of bars, cafes and restaurants.

Degree of effort was found to be the largest predictor of acceptability in bars and cafes, where as privacy was the most influencing variable in restaurants. This informs us that people have different needs and preferences depending on what type of environment they are in.

leads also to the conclusion based as it may seem that design leads for are are not entailed another reason

Environmental awareness was also one of the strongest and frequently occurring variables, showing that in bars and restaurants people are more aware of their surrounding acoustic environments. The fact that responses for these two environments were mainly polar opposites in questions that related to amount of noise and consciousness and preference of noise levels, shows us again the different expectations people have when visiting each of these environments. This however could also be interpreted as that the people who visit these environments are different initially, for example in noise sensitiveness. Further study would need to be done to conclude if personality differences do exist between people who choose a restaurant over a café or bar to socialise at.

It should be highlighted that situational factors are also a large determinant of why people choose one environment over another. For example, a person will generally not suggest catching up with their grandparent at midnight on a Friday or Saturday night at a trendy bar.

The lack of findings and strong relationships for café environments could be due to a number of reasons. It is possible that cafes in particular are actually providing acceptable acoustic conditions. This could be because people expect somewhat busy and 'noisy' environments when they go to a café, and that in general acoustical comfort is not one of the most important issues to them at this time.

Even though according to standards, cafes are providing a background noise floor higher than the design criteria, it is feasible that cafes are actually providing acceptable acoustic conditions.

This argument can be extended to restaurants and bars also, and is an argument for the noise-criteria (NC) sound levels to be revised. That is, how do we know that these recommended design levels are actually relevant to today's society? If the results from this study are considered, it seems that people are generally more accepting of louder noise floors than is being recommended. Again, this provides opportunity for further research into what are actually acceptable background noise levels for the current design and atmosphere of bars, restaurants and cafes at present.

The appropriateness of the average speech levels used in this study extends on from the previous finding. That is, the weak correlations found between STI and questions relating to speech levels suggest that people are talking at levels (most likely louder) than are currently being predicted. Therefore the suitability of the current ANSI speech levels to our studied environments needs to be reconsidered. However, if these ANSI speech levels are not correct for these environments, then how might one predict how loud people are actually communicating at? One possibility may be to record these conversations, although the many confounding variables would have to be addressed and assumed for prior. Once again, further study needs to occur into examining peoples actual speech levels in these restaurant, bar and café environments to make any conclusive statements around this topic.

If these ANSI speech levels are not appropriate anymore, what might be the reasons for this? Could it be that people have habituated to louder acoustic conditions and thus are more accommodating to noise levels? Or is it just that people in reality prefer these louder environments and actually like more competing and possibly 'lively' conditions? Yet again, the many personal and situational variables are too great and confounding to draw any significant arguments from this study.

An interesting and seemingly impossible problem to solve was identified by this study as has also been shown by past research [5]. Namely, that the most predominant and annoying noise source is other occupant's conversations. This annoyance is also increased when the actual source can be attributed or located to one particular person or table for example [5]. A possible way to overcome this conundrum would be to physically separate occupants for example by barriers or booths. However the negative impact on the social setting and atmosphere that people generally want and expect when they go to these environments (particularly in bars and cafes) would be greatly affected. A whole research study could be created just in this one little issue to see if people's perception of others noise can be reduced by either physical or psychological means.

When comparing the subjective descriptive means to the objective noise levels, it can be seen that the louder these levels are the more aware occupants are likely to be of their current surrounding acoustic environments. Hence they are more inclined to realise that they would prefer 'less noisy' or more intelligible environments. But, is this result because subjects were provoked to become aware of their acoustic surroundings? Would they still think the same thoughts anyway and notice their communication needs as much if they were not explicitly asked or stimulated to do so?

In another light, environmental awareness was a very predominant factor in bars. Could this be because the occupants are more emotionally charged and thus reactive to noise [5]? That is, it has been suggested that people who are having a social occasion are more likely to be emotional and engaging than they normally

would be. The strong relationships found between noise sensitivity and environmental awareness support these views additionally.

The most predominant question that these findings can assist in answering, is what relevance do these objective measures (STI, ANSI speech levels, NC-levels) really have in predicting socially acceptable acoustic environments? That is, in the field do people report speech effort and acceptance as predicted from these standards? Generally it can be argued from this study that an objective measure of these environments cannot predict a person's subjective interpretation. Namely, knowing a background noise level or STI of a venue from today's current standards tells us little about how a person interprets the environment. Evidence for this was the lack of correlation between STI levels and background noise levels to subjective responses of the various factors.

If background noise levels and STI's are not significant predictors, then how do we know how much noise level is too much or what levels people generally want?

The possibility that these acceptable conditions and speech levels could be predicted from subjective ratings was investigated. Correlations between these subjective factors to acceptability for each although were not conclusive enough to find a robust method or arrangement to predict an occupants acceptance and satisfaction. Therefore, an index from these identified factors was not an appropriate alternative to predict desirable conditions with. This was especially supported by the fact that completely different interpretation and factors were found between bars, cafes and restaurants.

Great variation was found not only between these three hospitality environments, but also within each of them. As a result, application of a general index cannot be justified even further. A greater sample size of venues would help overcome this issue in future study.

It is feasible that the factors and scales used to help account for acceptability are not really suited for these situations. However, if STI and background sound levels are not either, then can acceptability actually be measured? Several

viewpoints could be taken and investigated further as to the suitability of all of these subjective and objective measures.

Firstly, are any of these methods even necessary or worth the trouble? There are so many confounding variables that could influence how one perceives an acoustic environment at the time, that it seems hard and most probably impossible to control for or measure all of these. For example; the mood of an occupant at the time; the people they are socialising with, friends, family or work colleagues; and even their reasons for being there and what they subconsciously want to achieve out of the experience.

Secondly, there is the possibility that there are other variables more significant to predicting how a person perceives their surroundings that were not accounted for in this study. This has implications for future research into identifying what people think influences their evaluation of an acoustic environment.

Finally, is acceptability even the right measure to use as the yardstick to which we compare an occupant's subjective satisfaction of these acoustic environments? It seems arguable that of all the subjective factors studied it was the most suited (that is, the only one with correlations to STI and background noise levels). The fairly weak relationships between acceptability and all of the other measures although suggests that it may not be a suitable way to account for the psycho-acoustic rating of an environment.

Potential flaws with the study include the populations studied. That is, only people who were actually in these establishments were surveyed and therefore generalisation to the wider society is limited. For example, it could be entirely possible that results were biased because people who do not find these environments comfortable for their communication needs do not frequent them.

There is also an issue of how serious some responses could be taken. While it was tried to be prevented, it was often hard to avoid people who perhaps were not honest or true in their answers. This was mainly a predicament in bars.

One problem that was found with this data collection was that there was perhaps too much. This overload of variables and questions seemed to make analysis, and therefore the ability to draw conclusive arguments, a lot more

challenging. If future research is to be conducted based on this study, it would be recommended that the survey is condensed and refined as much as possible.

In conclusion, several views could be taken of the results found from this study. The first is that it confirmed its hypothesis that in general, bars, cafes and restaurants are too loud or undesirable acoustic conditions for occupants from an objective or acousticians point-of-view. From this perspective however, no conclusions can be made as to whether they are subjectively too loud or undesirable from an individual's personal experience. Hence, we are still unable to predict the real suitability and the exact conditions for an acceptable acoustic environment for the people who are actually encompassed by them. But, is this even appropriate? Should we be able to predict exactly how people will react and rate to a bar's, café's or restaurant's acoustics? This leads on to the second conclusion, that perhaps the current standards and speech levels are not appropriate guides. This provides argument for their need to be revised so that they are more appropriate to today's society or these specific environments with obviously higher levels of acceptability?

If one overall statement could be made from this study, it seems like the actual users of these environments do not seem to mind the current acoustic levels provided. Therefore, is there reason to show concern as to whether acoustical comfort is being achieved by bars, cafes and restaurants?

Acknowledgements

Firstly, thanks must go out to all the willing occupants of these bars, cafés and restaurants who completed the survey. Without their (staff and user's) co-operation and involvement, this subjective evaluation would not have been possible.

To enable this research to be undertaken initially, the bar, café and restaurant owners and managers that agreed to participate must also be acknowledged and thanked for their patience and co-operation.

Finally, I would like to acknowledge Marshall Day Acoustics for their helpful support and use of equipment.

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Appendices

Appendix A – Survey

Appendix B – Factor Analysis Results

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Appendix A

~ Survey Distributed

VICTORIA UNIVERSITY OF WELLINGTON
Te Whare Wananga o te Upoko o te Ika a Maui

SCHOOL OF ARCHITECTURE
Te Kura Waihanga

Participant Information Sheet for Survey of Environmental Acoustics in the Hospitality Industry.

Researchers: James Bell-Booth and Lauren Christie

We are final year students of Building Science at Victoria University of Wellington. As part of this degree we are currently undertaking independent research into the acoustic environment provided by cafés, restaurants and bars.

We are inviting you as an occupant of this environment to participate in this study so we can assess the subjective response of people to its acoustics. Participation is voluntary, and if you feel the need to withdraw from the study, you may do so without question at any time.

Responses collected will form the basis of the analysis and will be put into a written report and a conference paper on an anonymous basis where the responses are aggregated together to form a summary score or index.

It will not be possible for you to be identified personally. All material collected will be kept confidential. No other person besides our supervisors, Mike Donn and Miklin Halstead, or us will see the completed survey forms and results. The report will be submitted for marking to the School of Architecture and Design at Victoria University and all data collected will be destroyed after research has been completed.

If you have any questions or would like to receive further information about our research, please contact us, or our supervisor at the following addresses:

bellbojame@student.vuw.ac.nz
christlaur@student.vuw.ac.nz
mike.donn@vuw.ac.nz

Sincerely,

James Bell-Booth

Lauren Christie

Mailing address: PO Box 600, Wellington, New Zealand
Location: 139 Vivian Street, Wellington
Phone: 64-4-463 6221 Fax: 64-4-463 6204 E-mail: michael.donn@vuw.ac.nz

Acoustics in the Hospitality Industry Survey

Please answer questions 1 –7 with regard to your own attitude towards any generalised setting.

1. **How much noise do you like in bars/restaurants/cafes?**

Not much		Some		A lot
1	2	3	4	5

2. **Does noise influence your choice of bar/restaurant/cafe?**

Not much		Some		A lot
1	2	3	4	5

3. **How much noise do you expect in a bar/restaurant/cafe?**

Not much		Some		A lot
1	2	3	4	5

4. **When you choose a bar/restaurant/café are you concerned that there will be loud music?**

Not at all		Somewhat		Very
1	2	3	4	5

5. **Are you distracted by noises associated with kitchen or bar/counter areas?**

Not at all		Somewhat		Very
1	2	3	4	5

6. **Are you conscious of noises other occupants make?**

Not at all		Somewhat		Very
1	2	3	4	5

7. **Do you find it hard to relax in noisy environments?**

Not at all		Somewhat		Very
1	2	3	4	5

8. **Do you find it hard to relax in quiet environments?**

Not at all		Somewhat		Very
1	2	3	4	5

20. What level do you consider the music to be playing at?

Not at all		Some		Too Loud
1	2	3	4	5

21. Do you feel that noises at present have meaning and are necessary in this environment?

Not at all		Some		A lot
1	2	3	4	5

22. Does the level of noise affect your mood for the worse?

Not at all		Some		A lot
1	2	3	4	5

23. What source of sound is the most predominant (please tick one)?

Other people	☐
Music	☐
Kitchen sources	☐
Outside sources (e.g. traffic)	☐
Chairs/tables scraping	☐
Bottles/glasses	☐
Other	☐

24. **Do you find some noise sources at present more annoying than others?** (please tick one)

Yes	☐
No	☐

If **Yes**, please state which:.....

25. **How much on average, would you frequent each of these environments?** (please tick one for each)

	2-3 times a week	once a week	once a fortnight	once a month	less than once a month
Bars	☐	☐	☐	☐	☐
Cafés	☐	☐	☐	☐	☐
Restaurants	☐	☐	☐	☐	☐

26. **Out of these four environments, which would you expect to have the most favourable conditions for communication?** (please tick one)

Café	☐
Bar	☐
Restaurant	☐
Restaurant/Bar	☐

Appendix B

~ Factor Analysis Results

Tables present the main factors with appropriate overall label, correlations/weightings of individual questions, and percentage of variance explained by the factor overall.

1 –Bars

Factor	Main Questions (r>0.5)				% of Variance
1 –Environmental Awareness	**6** .786	**4** .755	**2** .734	**9** .543	**17.1**
2 - Degree of Effort	**13** .749	**11** .713	**10** .516		**9.4**
3 - Acceptability	**17** .868	**22** .816			**8.0**
4 – Noise Sensitivity	**3** .772	**7** .608	**1** .602		**6.8**
5 - Age	**Age** .872				**5.3**
6 - Control	**15** .754				**5.0**
7 – Perceived Noise Level	**16** .821	**20** .645			**3.9**
8 - Privacy	**18** .844	**8** .771			**2.4**

2 – Cafes

Factor	Main Questions (r>0.5)					% of Variance
1- Degree of Effort	**13** .798	**14** .790	**10** .757	**11** .747	**12** .605	**16.8**
2- Noise Sensitivity	**1** .591	**21** .585	**7** .562	**3** .544		**9.1**
3 - Age	**Age** .816					**6.9**
4 – Perceived Noise Level	**20** .502	**16** .498				**3.1**

3 – Restaurants

Factor	Main Questions (r>0.5)					% of Variance
1 – Degree of Effort	12	13	11	10	22	22.1
	.809	.785	.780	.730	.535	
2 – Noise Sensitivity	6	5	2	7		7.8
	.805	.731	.714	.548		
3 - Privacy	19	18				7.3
	.867	.744				
4 – Age	Age					6.1
	.801					
5 - Environmental Awareness	9	1				5.5
	.704	.545				
6 – Acceptability	16	17				4.6
	.737	.656				

4- All Three Categories Combined

Factor	Main Questions (r>0.5)					% of Variance
1 – Degree of Effort	11	13	10	12	14	16.3
	.768	.762	.682	.674	.507	
2 – Noise Sensitivity	6	5				6.9
	.738	.596				
3 – Acceptability	21	17				5.1
	.564	.551				
4 – Age	Age					4.5
	.767					
5 – Environmental Awareness	1	9				3.8
	.602	.533				
6 – Perceived Noise Level	20					2.5
	.656					

(Note that not all of the factors considered to account for a significant amount of variance in the survey, that is eigenvalues over 1.0, were used for further analysis in the results. Only significant ones are presented in these tables.)

Appendix C

~ Social Characteristics of the Sample

C.1. Restaurant 1

Age	Male		Female		Total	
	No.	%	No.	%	No.	%
≤25	0	0	1	8.3	1	5
25-35	6	86	10	83	16	84
36-45	1	28	1	8.3	2	11
46-60	0	0	0	0	0	0
≥60	0	0	0	0	0	0
Total	7	37	12	63	19	100

Average: 27
Range (min-max): 14 - 48

C.2. Restaurant 2

Age	Male		Female		Total	
	No.	%	No.	%	No.	%
≤25	0	0	4	33	4	20
25-35	4	50	4	33	8	40
36-45	4	50	4	33	8	40
46-60	0	0	0	0	0	0
≥60	0	0	0	0	0	0
Total	8	40	12	60	20	100

Average: 33
Range (min-max): 22 - 45

C.3. Restaurant 3

Age	Male		Female		Total	
	No.	%	No.	%	No.	%
≤25	7	50	3	75	10	56
25-35	6	43	0	0	6	33
36-45	1	7	1	25	2	11
46-60	0	0	0	0	0	0
≥60	0	0	0	0	0	0
Total	14	78	4	63	18	100

Average: 31
Range (min-max): 19 - 76

C.4. Café 1

Age	Male		Female		Total	
	No.	%	No.	%	No.	%
≤25	0	0	4	33	4	20
25-35	7	88	6	50	13	65
36-45	1	13	2	17	3	15
46-60	0	0	0	0	0	0
≥60	0	0	0	0	0	0
Total	8	40	12	60	20	100

Average: 30
Range (min-max): 22 - 41

C.5. Café 2

Age	Male		Female		Total	
	No.	%	No.	%	No.	%
≤25	0	0	2	12	2	10
25-35	1	25	7	44	8	40
36-45	1	25	7	44	8	40
46-60	2	50	0	0	0	0
≥60	0	0	0	0	0	0
Total	4	20	16	80	20	100

Average: 35
Range (min-max): 19 - 76

C.6. Café 3

Age	Male		Female		Total	
	No.	%	No.	%	No.	%
≤25	5	45	6	75	11	58
25-35	3	27	2	25	5	26
36-45	1	9	0	0	1	5
46-60	2	18	0	0	2	0
≥60	0	0	0	0	0	0
Total	11	58	8	42	19	100

Average: 29
Range (min-max): 21 - 55

C.7. Café 4

Age	Male		Female		Total	
	No.	%	No.	%	No.	%
≤25	1	8	1	14	2	10
25-35	4	31	3	43	7	35
36-45	3	23	0	0	3	15
46-60	2	15	2	29	4	20
≥60	3	23	1	14	4	20
Total	13	65	7	35	20	100

Average: 41
Range (min-max): 22 – 64

C.8. Bar 1

Age	Male		Female		Total	
	No.	%	No.	%	No.	%
≤25	0	0	4	50	4	21
25-35	5	45	3	38	8	42
36-45	5	45	0	0	5	26
46-60	1	9	1	13	2	11
≥60	0	0	0	0	0	0
Total	11	55	8	42	19	100

Average: 33
Range (min-max): 18 – 57

C.9. Bar 2

Age	Male		Female		Total	
	No.	%	No.	%	No.	%
≤25	3	20	3	60	6	30
25-35	7	47	1	20	8	40
36-45	5	33	1	20	6	30
46-60	0	0	0	0	0	0
≥60	0	0	0	0	0	0
Total	15	75	5	25	20	100

Average: 30
Range (min-max): 21 - 44

C.10. Bar 3

Age	Male		Female		Total	
	No.	%	No.	%	No.	%
≤25	5	100	14	93	19	95
25-35	0	0	1	7	1	5
36-45	0	0	0	0	0	0
46-60	0	0	0	0	0	0
≥60	0	0	0	0	0	0
Total	5	25	15	75	20	100

Average: 20
Range (min-max): 18 - 30

C.11. Bar 4

Age	Male		Female		Total	
	No.	%	No.	%	No.	%
≤25	5	50	5	56	10	53
25-35	2	20	2	22	4	21
36-45	2	20	1	11	3	16
46-60	1	10	1	11	2	11
≥60	0	0	0	0	0	0
Total	10	53	9	47	19	100

Average: 30
Range (min-max): 21 – 53

C.12. Restaurants Overall

Age	Male		Female		Total	
	No.	%	No.	%	No.	%
≤25	7	24	8	29	15	26
25-35	16	55	14	50	30	53
36-45	6	21	6	21	12	21
46-60	0	0	0	0	0	0
≥60	0	0	0	0	0	0
Total	29	51	28	49	57	100

Average: 27

C.13. Cafes Overall

Age	Male		Female		Total	
	No.	%	No.	%	No.	%
≤25	6	17	13	30	19	24
25-35	15	42	18	42	33	42
36-45	6	17	9	21	15	19
46-60	6	17	2	5	8	10
≥60	3	8	1	2	4	5
Total	36	46	43	54	79	100

Average: 34

C.14. Bars Overall

Age	Male		Female		Total	
	No.	%	No.	%	No.	%
≤25	8	22	26	70	34	47
25-35	14	39	7	19	21	29
36-45	12	33	2	5	14	19
46-60	2	6	2	5	4	5
≥60	0	0	0	0	0	0
Total	36	49	37	51	73	100

Average: 28

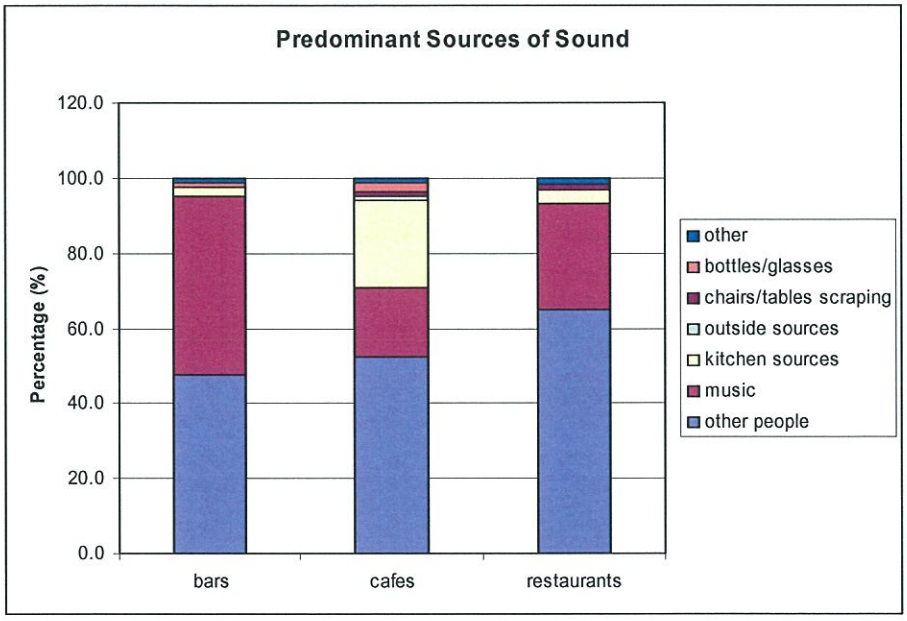
Appendix D

~ Predominant Sources of Sound

Table D.1. Distribution of Sound Sources

	Count			Percentage (%)		
	bars	cafes	restaurants	bars	cafes	restaurants
other people	39	45	39	47.6	52.3	65.0
music	39	16	17	47.6	18.6	28.3
kitchen sources	2	20	2	2.4	23.3	3.3
outside sources	0	1	0	0.0	1.2	0.0
chairs/tables scraping	0	1	1	0.0	1.2	1.7
bottles/glasses	1	2	0	1.2	2.3	0.0
other	1	1	1	1.2	1.2	1.7
total	82	86	60	100	100	100

Figure 2: Distribution of Sound Sources in Each of the Environments.

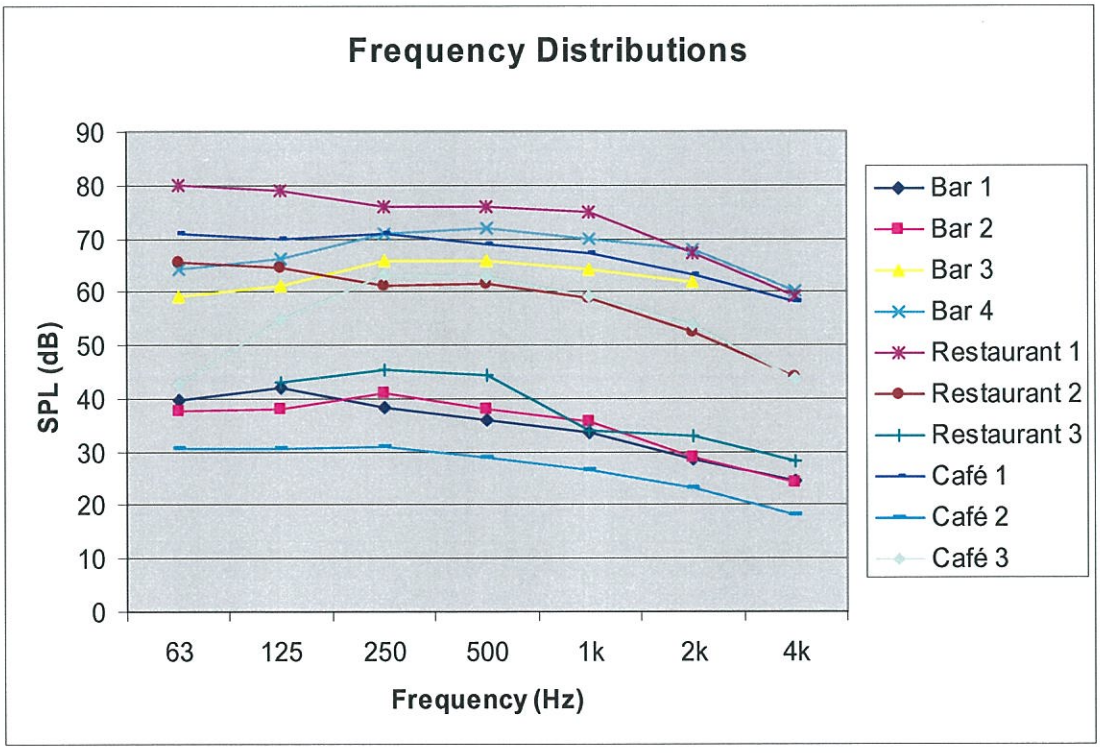


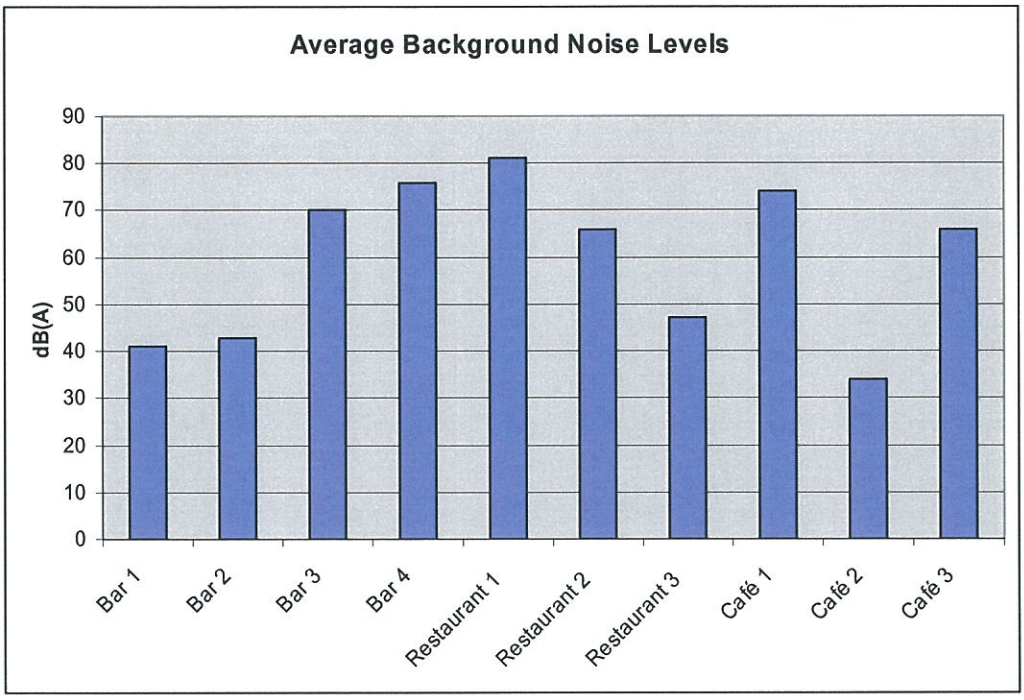
Appendix E

~ Physical Characteristics of the Environments

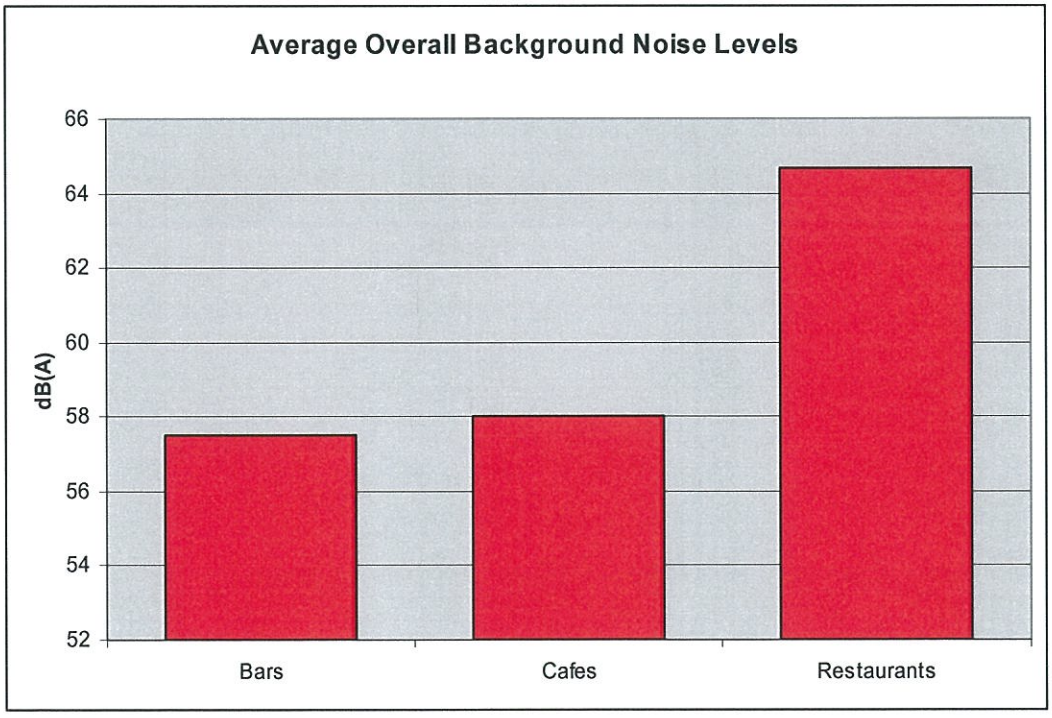
E.1. Background Sound Level Recordings

Octave Centre Frequency (Hz)	125	250	500	1000	2000	4000	8000	Average dB(A)
Bar 1	40	42	38	36	34	29	24	**41**
Bar 2	38	38	41	38	36	29	24	**43**
Bar 3	59	61	66	66	64	62	-	**70**
Bar 4	64	66	71	72	70	68	60	**76**
Restaurant 1	80	79	76	76	75	67	59	**81**
Restaurant 2	65	64	61	61	59	52	44	**66**
Restaurant 3	-	43	45	44	34	33	28	**47**
Café 1	71	70	71	69	67	63	58	**74**
Café 2	31	30	31	29	27	23	18	**34**
Café 3	43	55	63	63	59	54	44	**66**





	Average Background Sound Level dB(A)
Bars	58
Cafes	58
Restaurants	65
Average	**60**

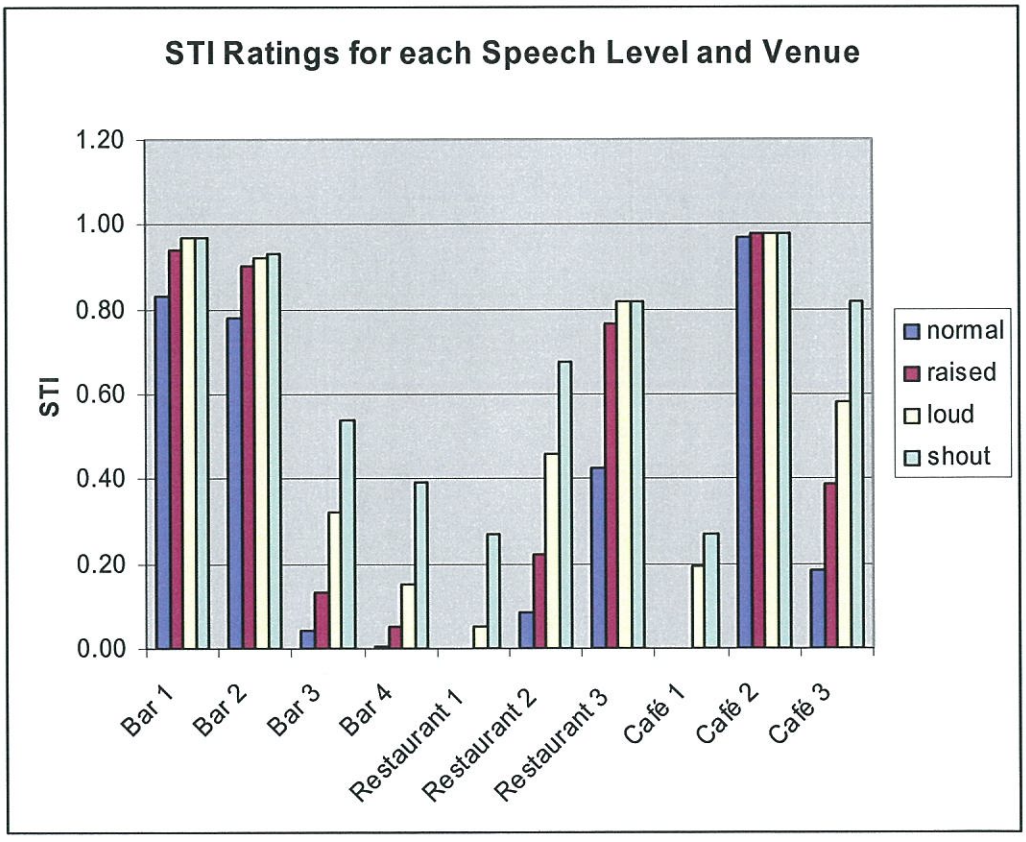


E.2. Speech Intelligibility Indices

	normal	raised	loud	shout	Average
Bar 1	0.83	0.94	0.97	0.97	**0.93**
Bar 2	0.78	0.90	0.92	0.93	**0.88**
Bar 3	0.04	0.13	0.32	0.54	**0.26**
Bar 4	0.01	0.05	0.15	0.39	**0.15**
Restaurant 1	0.00	0.00	0.05	0.27	**0.08**
Restaurant 2	0.08	0.22	0.46	0.68	**0.36**
Restaurant 3	0.43	0.77	0.82	0.82	**0.71**
Café 1	0.00	0.00	0.19	0.27	**0.12**
Café 2	0.97	0.98	0.98	0.98	**0.98**
Café 3	0.18	0.39	0.58	0.82	**0.49**

Overall Average

	normal	raised	loud	shout	Average
Bars	0.41	0.51	0.59	0.71	**0.55**
Cafes	0.58	0.45	0.58	0.69	**0.58**
Restaurants	0.17	0.33	0.44	0.59	**0.38**



Appendix F

~ Comparison of Means

	Bars	Restaurants	Cafés	Bars	Restaurants	Cafés
Question		***Average***			***Percentage (%)***	
1	3	1.84	1.91	*33.3*	*-1.9*	*0.0*
2	3.29	3.21	3.16	*2.2*	*-0.4*	*-1.8*
3	2.21	2.37	2.2	*-2.21*	*0.0*	*0.0*
4	2.73	3.04	2.94	*-6.1*	*4.8*	*1.3*
5	2.41	2.32	2.38	*1.8*	*-2.1*	*0.3*
6	2.73	2.98	2.90	*-5.0*	*4.0*	*1.1*
7	2.68	3.02	2.93	*-6.9*	*5.0*	*1.8*
8	2.30	1.93	1.86	*13.4*	*-4.9*	*-8.5*
9	4.03	3.97	4.07	*0.2*	*-1.3*	*1.1*
10	2.96	2.67	2.59	*8.1*	*-2.6*	*-5.5*
11	2.37	2.31	2.07	*5.4*	*2.5*	*-7.9*
12	2.25	2.30	2.17	*0.4*	*2.6*	*-3.0*
13	2.96	2.67	2.68	*6.9*	*-3.8*	*-3.2*
14	2.50	2.45	2.38	*2.4*	*0.2*	*-2.6*
15	0.99	0.71	0.84	*13.7*	*-6.5*	*43.0*
16	2.15	1.96	2.22	*4.0*	*-12.8*	*53.4*
17	2.85	2.55	2.58	*18.7*	*-1.7*	*36.8*
18	2.10	1.87	2.00	*5.3*	*-5.9*	*0.6*
19	2.65	2.54	2.19	*19.1*	*17.6*	*26.9*
20	2.86	2.81	2.25	*8.2*	*6.6*	*-14.8*
21	2.33	2.38	2.43	*-4.6*	*-2.1*	*54.5*
22	2.11	2.21	2.26	*-3.9*	*0.7*	*3.2*

Appendix G

~ Inferential Statistics

G.1. Correlations between Main Subjective Factors

(a) Bars

		ACCEPT	ENVIROAW	DOFE	NS	CONTROL	NSELVL	PRIVACY
Pearson Correlation	ACCEPT	1.000	.397	.622	.316	.219	.335	.299
	ENVIROAW	.397	1.000	.397	.633	.160	.414	.176
	DOFE	.622	.397	1.000	.346	.407	.587	.261
	NS	.316	.633	.346	1.000	.031	.352	.074
	CONTROL	.219	.160	.407	.031	1.000	.340	.139
	NSELVL	.335	.414	.587	.352	.340	1.000	.139
	PRIVACY	.299	.176	.261	.074	.139	.139	1.000
Sig. (1-tailed)	ACCEPT	.	.000	.000	.002	.026	.001	.004
	ENVIROAW	.000	.	.000	.000	.078	.000	.059
	DOFE	.000	.000	.	.001	.000	.000	.010
	NS	.002	.000	.001	.	.392	.001	.258
	CONTROL	.026	.078	.000	.392	.	.001	.109
	NSELVL	.001	.000	.000	.001	.001	.	.109
	PRIVACY	.004	.059	.010	.258	.109	.109	.
N	ACCEPT	80	80	80	80	80	80	80
	ENVIROAW	80	80	80	80	80	80	80
	DOFE	80	80	80	80	80	80	80
	NS	80	80	80	80	80	80	80
	CONTROL	80	80	80	80	80	80	80
	NSELVL	80	80	80	80	80	80	80
	PRIVACY	80	80	80	80	80	80	80

(b) Cafes

		ACCEPT	DOFE	NS	NSELVL	AGE
Pearson Correlation	ACCEPT	1.000	.391	.291	.331	-.128
	DOFE	.391	1.000	.332	.220	-.024
	NS	.291	.332	1.000	.045	-.029
	NSELVL	.331	.220	.045	1.000	-.089
	AGE	-.128	-.024	-.029	-.089	1.000
Sig. (1-tailed)	ACCEPT	.	.000	.005	.002	.133
	DOFE	.000	.	.002	.027	.418
	NS	.005	.002	.	.348	.400
	NSELVL	.002	.027	.348	.	.220
	AGE	.133	.418	.400	.220	.
N	ACCEPT	77	77	77	77	77
	DOFE	77	77	77	77	77
	NS	77	77	77	77	77
	NSELVL	77	77	77	77	77
	AGE	77	77	77	77	77

(c) Restaurants

		ACCEPT	AGE	DOFE	NS	PRIVACY	ENVIROAW
Pearson Correlation	ACCEPT	1.000	-.038	.065	.197	.261	.168
	AGE	-.038	1.000	.121	-.061	.044	.044
	DOFE	.065	.121	1.000	.239	.194	.526
	NS	.197	-.061	.239	1.000	.224	.433
	PRIVACY	.261	.044	.194	.224	1.000	.018
	ENVIROAW	.168	.044	.526	.433	.018	1.000
Sig. (1-tailed)	ACCEPT	.	.388	.311	.067	.023	.101
	AGE	.388	.	.181	.323	.371	.370
	DOFE	.311	.181	.	.034	.071	.000
	NS	.067	.323	.034	.	.044	.000
	PRIVACY	.023	.371	.071	.044	.	.446
	ENVIROAW	.101	.370	.000	.000	.446	.
N	ACCEPT	59	59	59	59	59	59
	AGE	59	59	59	59	59	59
	DOFE	59	59	59	59	59	59
	NS	59	59	59	59	59	59
	PRIVACY	59	59	59	59	59	59
	ENVIROAW	59	59	59	59	59	59

G.2. *Correlations between Objective Measures and Subjective Factors*

(a) Bars

		ACCEPT	DBA
Pearson Correlation	ACCEPT	1.000	-.017
	DBA	-.017	1.000
Sig. (1-tailed)	ACCEPT	.	.440
	DBA	.440	.
N	ACCEPT	80	80
	DBA	80	80

		ACCEPT	STI.NORM	STI.RAIS	STI.LOUD	STI.SHOU
Pearson Correlation	ACCEPT	1.000	.016	.015	.018	.019
	STI.NORM	.016	1.000	.999	.991	.983
	STI.RAIS	.015	.999	1.000	.995	.989
	STI.LOUD	.018	.991	.995	1.000	.999
	STI.SHOU	.019	.983	.989	.999	1.000
Sig. (1-tailed)	ACCEPT	.	.444	.446	.438	.434
	STI.NORM	.444	.	.000	.000	.000
	STI.RAIS	.446	.000	.	.000	.000
	STI.LOUD	.438	.000	.000	.	.000
	STI.SHOU	.434	.000	.000	.000	.
N	ACCEPT	80	80	80	80	80
	STI.NORM	80	80	80	80	80
	STI.RAIS	80	80	80	80	80
	STI.LOUD	80	80	80	80	80
	STI.SHOU	80	80	80	80	80

		STI.NORM	ENVIROAW	DOFE	ACCEPT	NS	CONTROL	NSELVL	PRIVACY
Pearson Correlation	STI.NORM	1.000	.014	-.033	.016	-.012	.077	.032	.165
	ENVIROAW	.014	1.000	.397	.397	.633	.160	.414	.176
	DOFE	-.033	.397	1.000	.622	.346	.407	.587	.261
	ACCEPT	.016	.397	.622	1.000	.316	.219	.335	.299
	NS	-.012	.633	.346	.316	1.000	.031	.352	.074
	CONTROL	.077	.160	.407	.219	.031	1.000	.340	.139
	NSELVL	.032	.414	.587	.335	.352	.340	1.000	.139
	PRIVACY	.165	.176	.261	.299	.074	.139	.139	1.000
Sig. (1-tailed)	STI.NORM	.	.450	.384	.444	.457	.248	.389	.072
	ENVIROAW	.450	.	.000	.000	.000	.078	.000	.059
	DOFE	.384	.000	.	.000	.001	.000	.000	.010
	ACCEPT	.444	.000	.000	.	.002	.026	.001	.004
	NS	.457	.000	.001	.002	.	.392	.001	.258
	CONTROL	.248	.078	.000	.026	.392	.	.001	.109
	NSELVL	.389	.000	.000	.001	.001	.001	.	.109
	PRIVACY	.072	.059	.010	.004	.258	.109	.109	.
N	STI.NORM	80	80	80	80	80	80	80	80
	ENVIROAW	80	80	80	80	80	80	80	80
	DOFE	80	80	80	80	80	80	80	80
	ACCEPT	80	80	80	80	80	80	80	80
	NS	80	80	80	80	80	80	80	80
	CONTROL	80	80	80	80	80	80	80	80
	NSELVL	80	80	80	80	80	80	80	80
	PRIVACY	80	80	80	80	80	80	80	80

		STI.LOUD	ENVIROAW	DOFE	ACCEPT	NS	CONTROL	NSELVL	PRIVACY
Pearson Correlation	STI.LOUD	1.000	.021	-.018	.018	-.007	.120	.050	.154
	ENVIROAW	.021	1.000	.397	.397	.633	.160	.414	.176
	DOFE	-.018	.397	1.000	.622	.346	.407	.587	.261
	ACCEPT	.018	.397	.622	1.000	.316	.219	.335	.299
	NS	-.007	.633	.346	.316	1.000	.031	.352	.074
	CONTROL	.120	.160	.407	.219	.031	1.000	.340	.139
	NSELVL	.050	.414	.587	.335	.352	.340	1.000	.139
	PRIVACY	.154	.176	.261	.299	.074	.139	.139	1.000
Sig. (1-tailed)	STI.LOUD	.	.426	.438	.438	.476	.144	.331	.087
	ENVIROAW	.426	.	.000	.000	.000	.078	.000	.059
	DOFE	.438	.000	.	.000	.001	.000	.000	.010
	ACCEPT	.438	.000	.000	.	.002	.026	.001	.004
	NS	.476	.000	.001	.002	.	.392	.001	.258
	CONTROL	.144	.078	.000	.026	.392	.	.001	.109
	NSELVL	.331	.000	.000	.001	.001	.001	.	.109
	PRIVACY	.087	.059	.010	.004	.258	.109	.109	.
N	STI.LOUD	80	80	80	80	80	80	80	80
	ENVIROAW	80	80	80	80	80	80	80	80
	DOFE	80	80	80	80	80	80	80	80
	ACCEPT	80	80	80	80	80	80	80	80
	NS	80	80	80	80	80	80	80	80
	CONTROL	80	80	80	80	80	80	80	80
	NSELVL	80	80	80	80	80	80	80	80
	PRIVACY	80	80	80	80	80	80	80	80

		STI.LOUD	ENVIROAW	DOFE	ACCEPT	NS	CONTROL	NSELVL	PRIVACY
Pearson Correlation	STI.LOUD	1.000	.021	-.018	.018	-.007	.120	.050	.154
	ENVIROAW	.021	1.000	.397	.397	.633	.160	.414	.176
	DOFE	-.018	.397	1.000	.622	.346	.407	.587	.261
	ACCEPT	.018	.397	.622	1.000	.316	.219	.335	.299
	NS	-.007	.633	.346	.316	1.000	.031	.352	.074
	CONTROL	.120	.160	.407	.219	.031	1.000	.340	.139
	NSELVL	.050	.414	.587	.335	.352	.340	1.000	.139
	PRIVACY	.154	.176	.261	.299	.074	.139	.139	1.000
Sig. (1-tailed)	STI.LOUD	.	.426	.438	.438	.476	.144	.331	.087
	ENVIROAW	.426	.	.000	.000	.000	.078	.000	.059
	DOFE	.438	.000	.	.000	.001	.000	.000	.010
	ACCEPT	.438	.000	.000	.	.002	.026	.001	.004
	NS	.476	.000	.001	.002	.	.392	.001	.258
	CONTROL	.144	.078	.000	.026	.392	.	.001	.109
	NSELVL	.331	.000	.000	.001	.001	.001	.	.109
	PRIVACY	.087	.059	.010	.004	.258	.109	.109	.
N	STI.LOUD	80	80	80	80	80	80	80	80
	ENVIROAW	80	80	80	80	80	80	80	80
	DOFE	80	80	80	80	80	80	80	80
	ACCEPT	80	80	80	80	80	80	80	80
	NS	80	80	80	80	80	80	80	80
	CONTROL	80	80	80	80	80	80	80	80
	NSELVL	80	80	80	80	80	80	80	80
	PRIVACY	80	80	80	80	80	80	80	80

		STI.SHOU	ENVIROAW	DOFE	ACCEPT	NS	CONTROL	NSELVL	PRIVACY
Pearson Correlation	STI.SHOU	1.000	.023	-.013	.019	-.005	.134	.055	.149
	ENVIROAW	.023	1.000	.397	.397	.633	.160	.414	.176
	DOFE	-.013	.397	1.000	.622	.346	.407	.587	.261
	ACCEPT	.019	.397	.622	1.000	.316	.219	.335	.299
	NS	-.005	.633	.346	.316	1.000	.031	.352	.074
	CONTROL	.134	.160	.407	.219	.031	1.000	.340	.139
	NSELVL	.055	.414	.587	.335	.352	.340	1.000	.139
	PRIVACY	.149	.176	.261	.299	.074	.139	.139	1.000
Sig. (1-tailed)	STI.SHOU	.	.418	.455	.434	.482	.118	.313	.093
	ENVIROAW	.418	.	.000	.000	.000	.078	.000	.059
	DOFE	.455	.000	.	.000	.001	.000	.000	.010
	ACCEPT	.434	.000	.000	.	.002	.026	.001	.004
	NS	.482	.000	.001	.002	.	.392	.001	.258
	CONTROL	.118	.078	.000	.026	.392	.	.001	.109
	NSELVL	.313	.000	.000	.001	.001	.001	.	.109
	PRIVACY	.093	.059	.010	.004	.258	.109	.109	.
N	STI.SHOU	80	80	80	80	80	80	80	80
	ENVIROAW	80	80	80	80	80	80	80	80
	DOFE	80	80	80	80	80	80	80	80
	ACCEPT	80	80	80	80	80	80	80	80
	NS	80	80	80	80	80	80	80	80
	CONTROL	80	80	80	80	80	80	80	80
	NSELVL	80	80	80	80	80	80	80	80
	PRIVACY	80	80	80	80	80	80	80	80

		DBA	STI.NORM	STI.RAIS	STI.LOUD	STI.SHOU
Pearson Correlation	DBA	1.000	-.961	-.985	-.994	-.941
	STI.NORM	-.961	1.000	.994	.927	.812
	STI.RAIS	-.985	.994	1.000	.961	.868
	STI.LOUD	-.994	.927	.961	1.000	.972
	STI.SHOU	-.941	.812	.868	.972	1.000
Sig. (1-tailed)	DBA	.	.000	.000	.000	.000
	STI.NORM	.000	.	.000	.000	.000
	STI.RAIS	.000	.000	.	.000	.000
	STI.LOUD	.000	.000	.000	.	.000
	STI.SHOU	.000	.000	.000	.000	.
N	DBA	60	60	60	60	60
	STI.NORM	60	60	60	60	60
	STI.RAIS	60	60	60	60	60
	STI.LOUD	60	60	60	60	60
	STI.SHOU	60	60	60	60	60

		V13	STI.NORM	STI.RAIS	STI.LOUD	STI.SHOU
Pearson Correlation	V13	1.000	-.117	-.113	-.110	-.108
	STI.NORM	-.117	1.000	.999	.991	.983
	STI.RAIS	-.113	.999	1.000	.995	.989
	STI.LOUD	-.110	.991	.995	1.000	.999
	STI.SHOU	-.108	.983	.989	.999	1.000
Sig. (1-tailed)	V13	.	.157	.165	.172	.177
	STI.NORM	.157	.	.000	.000	.000
	STI.RAIS	.165	.000	.	.000	.000
	STI.LOUD	.172	.000	.000	.	.000
	STI.SHOU	.177	.000	.000	.000	.
N	V13	76	76	76	76	76
	STI.NORM	76	76	76	76	76
	STI.RAIS	76	76	76	76	76
	STI.LOUD	76	76	76	76	76
	STI.SHOU	76	76	76	76	76

(b) Cafes

		ACCEPT	DBA
Pearson Correlation	ACCEPT	1.000	-.141
	DBA	-.141	1.000
Sig. (1-tailed)	ACCEPT	.	.141
	DBA	.141	.
N	ACCEPT	60	60
	DBA	60	60

		ACCEPT	STI.NORM	STI.RAIS	STI.LOUD	STI.SHOU
Pearson Correlation	ACCEPT	1.000	.141	.144	.142	.129
	STI.NORM	.141	1.000	.973	.942	.793
	STI.RAIS	.144	.973	1.000	.994	.911
	STI.LOUD	.142	.942	.994	1.000	.951
	STI.SHOU	.129	.793	.911	.951	1.000
Sig. (1-tailed)	ACCEPT	.	.142	.137	.139	.162
	STI.NORM	.142	.	.000	.000	.000
	STI.RAIS	.137	.000	.	.000	.000
	STI.LOUD	.139	.000	.000	.	.000
	STI.SHOU	.162	.000	.000	.000	.
N	ACCEPT	60	60	60	60	60
	STI.NORM	60	60	60	60	60
	STI.RAIS	60	60	60	60	60
	STI.LOUD	60	60	60	60	60
	STI.SHOU	60	60	60	60	60

		STI.NORM	DOFE	NS	NSELVL	ACCEPT	AGE
Pearson Correlation	STI.NORM	1.000	.191	-.023	.160	.158	.324
	DOFE	.191	1.000	.325	.194	.465	-.028
	NS	-.023	.325	1.000	.157	.339	-.123
	NSELVL	.160	.194	.157	1.000	.382	.271
	ACCEPT	.158	.465	.339	.382	1.000	-.065
	AGE	.324	-.028	-.123	.271	-.065	1.000
Sig. (1-tailed)	STI.NORM	.	.076	.432	.115	.119	.006
	DOFE	.076	.	.006	.072	.000	.417
	NS	.432	.006	.	.119	.005	.179
	NSELVL	.115	.072	.119	.	.002	.020
	ACCEPT	.119	.000	.005	.002	.	.314
	AGE	.006	.417	.179	.020	.314	.
N	STI.NORM	58	58	58	58	58	58
	DOFE	58	58	58	58	58	58
	NS	58	58	58	58	58	58
	NSELVL	58	58	58	58	58	58
	ACCEPT	58	58	58	58	58	58
	AGE	58	58	58	58	58	58

		STI.RAIS	DOFE	NS	NSELVL	ACCEPT	AGE
Pearson Correlation	STI.RAIS	1.000	.185	-.024	.166	.157	.292
	DOFE	.185	1.000	.325	.194	.465	-.028
	NS	-.024	.325	1.000	.157	.339	-.123
	NSELVL	.166	.194	.157	1.000	.382	.271
	ACCEPT	.157	.465	.339	.382	1.000	-.065
	AGE	.292	-.028	-.123	.271	-.065	1.000
Sig. (1-tailed)	STI.RAIS	.	.082	.428	.106	.120	.013
	DOFE	.082	.	.006	.072	.000	.417
	NS	.428	.006	.	.119	.005	.179
	NSELVL	.106	.072	.119	.	.002	.020
	ACCEPT	.120	.000	.005	.002	.	.314
	AGE	.013	.417	.179	.020	.314	.
N	STI.RAIS	58	58	58	58	58	58
	DOFE	58	58	58	58	58	58
	NS	58	58	58	58	58	58
	NSELVL	58	58	58	58	58	58
	ACCEPT	58	58	58	58	58	58
	AGE	58	58	58	58	58	58

		STI.LOUD	DOFE	NS	NSELVL	ACCEPT	AGE
Pearson Correlation	STI.LOUD	1.000	.179	-.024	.166	.154	.271
	DOFE	.179	1.000	.325	.194	.465	-.028
	NS	-.024	.325	1.000	.157	.339	-.123
	NSELVL	.166	.194	.157	1.000	.382	.271
	ACCEPT	.154	.465	.339	.382	1.000	-.065
	AGE	.271	-.028	-.123	.271	-.065	1.000
Sig. (1-tailed)	STI.LOUD	.	.089	.428	.106	.125	.020
	DOFE	.089	.	.006	.072	.000	.417
	NS	.428	.006	.	.119	.005	.179
	NSELVL	.106	.072	.119	.	.002	.020
	ACCEPT	.125	.000	.005	.002	.	.314
	AGE	.020	.417	.179	.020	.314	.
N	STI.LOUD	58	58	58	58	58	58
	DOFE	58	58	58	58	58	58
	NS	58	58	58	58	58	58
	NSELVL	58	58	58	58	58	58
	ACCEPT	58	58	58	58	58	58
	AGE	58	58	58	58	58	58

		STI.SHOU	DOFE	NS	NSELVL	ACCEPT	AGE
Pearson Correlation	STI.SHOU	1.000	.150	-.023	.155	.135	.195
	DOFE	.150	1.000	.325	.194	.465	-.028
	NS	-.023	.325	1.000	.157	.339	-.123
	NSELVL	.155	.194	.157	1.000	.382	.271
	ACCEPT	.135	.465	.339	.382	1.000	-.065
	AGE	.195	-.028	-.123	.271	-.065	1.000
Sig. (1-tailed)	STI.SHOU	.	.130	.431	.122	.157	.071
	DOFE	.130	.	.006	.072	.000	.417
	NS	.431	.006	.	.119	.005	.179
	NSELVL	.122	.072	.119	.	.002	.020
	ACCEPT	.157	.000	.005	.002	.	.314
	AGE	.071	.417	.179	.020	.314	.
N	STI.SHOU	58	58	58	58	58	58
	DOFE	58	58	58	58	58	58
	NS	58	58	58	58	58	58
	NSELVL	58	58	58	58	58	58
	ACCEPT	58	58	58	58	58	58
	AGE	58	58	58	58	58	58

		DBA	STI.NORM	STI.RAIS	STI.LOUD	STI.SHOU
Pearson Correlation	DBA	1.000	-1.000	-.977	-.947	-.802
	STI.NORM	-1.000	1.000	.973	.942	.793
	STI.RAIS	-.977	.973	1.000	.994	.911
	STI.LOUD	-.947	.942	.994	1.000	.951
	STI.SHOU	-.802	.793	.911	.951	1.000
Sig. (1-tailed)	DBA	.	.000	.000	.000	.000
	STI.NORM	.000	.	.000	.000	.000
	STI.RAIS	.000	.000	.	.000	.000
	STI.LOUD	.000	.000	.000	.	.000
	STI.SHOU	.000	.000	.000	.000	.
N	DBA	60	60	60	60	60
	STI.NORM	60	60	60	60	60
	STI.RAIS	60	60	60	60	60
	STI.LOUD	60	60	60	60	60
	STI.SHOU	60	60	60	60	60

		V13	STI.NORM	STI.RAIS	STI.LOUD	STI.SHOU
Pearson Correlation	V13	1.000	.135	.112	.099	.056
	STI.NORM	.135	1.000	.973	.942	.793
	STI.RAIS	.112	.973	1.000	.994	.911
	STI.LOUD	.099	.942	.994	1.000	.951
	STI.SHOU	.056	.793	.911	.951	1.000
Sig. (1-tailed)	V13	.	.152	.197	.226	.336
	STI.NORM	.152	.	.000	.000	.000
	STI.RAIS	.197	.000	.	.000	.000
	STI.LOUD	.226	.000	.000	.	.000
	STI.SHOU	.336	.000	.000	.000	.
N	V13	60	60	60	60	60
	STI.NORM	60	60	60	60	60
	STI.RAIS	60	60	60	60	60
	STI.LOUD	60	60	60	60	60
	STI.SHOU	60	60	60	60	60

(c) Restaurants

		ACCEPT	DBA
Pearson Correlation	ACCEPT	1.000	-.228
	DBA	-.228	1.000
Sig. (1-tailed)	ACCEPT	.	.040
	DBA	.040	.
N	ACCEPT	60	60
	DBA	60	60

		ACCEPT	STI.NORM	STI.RAIS	STI.LOUD	STI.SHOU
Pearson Correlation	ACCEPT	1.000	.262	.252	.210	.162
	STI.NORM	.262	1.000	.994	.927	.812
	STI.RAIS	.252	.994	1.000	.961	.868
	STI.LOUD	.210	.927	.961	1.000	.972
	STI.SHOU	.162	.812	.868	.972	1.000
Sig. (1-tailed)	ACCEPT	.	.021	.026	.053	.108
	STI.NORM	.021	.	.000	.000	.000
	STI.RAIS	.026	.000	.	.000	.000
	STI.LOUD	.053	.000	.000	.	.000
	STI.SHOU	.108	.000	.000	.000	.
N	ACCEPT	60	60	60	60	60
	STI.NORM	60	60	60	60	60
	STI.RAIS	60	60	60	60	60
	STI.LOUD	60	60	60	60	60
	STI.SHOU	60	60	60	60	60

		STI.NORM	HEARING	DOFE	NS	PRIVACY	ENVIROAW	ACCEPT	AGE
Pearson Correlation	STI.NORM	1.000	-.057	-.067	.127	-.038	.065	.202	.100
	HEARING	-.057	1.000	.223	-.226	.088	-.110	-.065	-.008
	DOFE	-.067	.223	1.000	.241	.194	.529	.070	.121
	NS	.127	-.226	.241	1.000	.225	.429	.182	-.055
	PRIVACY	-.038	.088	.194	.225	1.000	.018	.270	.044
	ENVIROAW	.065	-.110	.529	.429	.018	1.000	.153	.051
	ACCEPT	.202	-.065	.070	.182	.270	.153	1.000	-.020
	AGE	.100	-.008	.121	-.055	.044	.051	-.020	1.000
Sig. (1-tailed)	STI.NORM	.	.335	.309	.170	.390	.314	.064	.229
	HEARING	.335	.	.046	.044	.255	.206	.315	.477
	DOFE	.309	.046	.	.034	.073	.000	.300	.184
	NS	.170	.044	.034	.	.044	.000	.086	.342
	PRIVACY	.390	.255	.073	.044	.	.446	.020	.372
	ENVIROAW	.314	.206	.000	.000	.446	.	.126	.353
	ACCEPT	.064	.315	.300	.086	.020	.126	.	.440
	AGE	.229	.477	.184	.342	.372	.353	.440	.
N	STI.NORM	58	58	58	58	58	58	58	58
	HEARING	58	58	58	58	58	58	58	58
	DOFE	58	58	58	58	58	58	58	58
	NS	58	58	58	58	58	58	58	58
	PRIVACY	58	58	58	58	58	58	58	58
	ENVIROAW	58	58	58	58	58	58	58	58
	ACCEPT	58	58	58	58	58	58	58	58
	AGE	58	58	58	58	58	58	58	58

		STI.RAIS	HEARING	DOFE	NS	PRIVACY	ENVIROAW	ACCEPT	AGE
Pearson Correlation	STI.RAIS	1.000	-.040	-.052	.120	-.059	.065	.185	.119
	HEARING	-.040	1.000	.223	-.226	.088	-.110	-.065	-.008
	DOFE	-.052	.223	1.000	.241	.194	.529	.070	.121
	NS	.120	-.226	.241	1.000	.225	.429	.182	-.055
	PRIVACY	-.059	.088	.194	.225	1.000	.018	.270	.044
	ENVIROAW	.065	-.110	.529	.429	.018	1.000	.153	.051
	ACCEPT	.185	-.065	.070	.182	.270	.153	1.000	-.020
	AGE	.119	-.008	.121	-.055	.044	.051	-.020	1.000
Sig. (1-tailed)	STI.RAIS	.	.382	.348	.186	.330	.314	.082	.187
	HEARING	.382	.	.046	.044	.255	.206	.315	.477
	DOFE	.348	.046	.	.034	.073	.000	.300	.184
	NS	.186	.044	.034	.	.044	.000	.086	.342
	PRIVACY	.330	.255	.073	.044	.	.446	.020	.372
	ENVIROAW	.314	.206	.000	.000	.446	.	.126	.353
	ACCEPT	.082	.315	.300	.086	.020	.126	.	.440
	AGE	.187	.477	.184	.342	.372	.353	.440	.
N	STI.RAIS	58	58	58	58	58	58	58	58
	HEARING	58	58	58	58	58	58	58	58
	DOFE	58	58	58	58	58	58	58	58
	NS	58	58	58	58	58	58	58	58
	PRIVACY	58	58	58	58	58	58	58	58
	ENVIROAW	58	58	58	58	58	58	58	58
	ACCEPT	58	58	58	58	58	58	58	58
	AGE	58	58	58	58	58	58	58	58

		STI.LOUD	HEARING	DOFE	NS	PRIVACY	ENVIROAW	ACCEPT	AGE
Pearson Correlation	STI.LOUD	1.000	.006	-.011	.093	-.112	.062	.131	.164
	HEARING	.006	1.000	.223	-.226	.088	-.110	-.065	-.008
	DOFE	-.011	.223	1.000	.241	.194	.529	.070	.121
	NS	.093	-.226	.241	1.000	.225	.429	.182	-.055
	PRIVACY	-.112	.088	.194	.225	1.000	.018	.270	.044
	ENVIROAW	.062	-.110	.529	.429	.018	1.000	.153	.051
	ACCEPT	.131	-.065	.070	.182	.270	.153	1.000	-.020
	AGE	.164	-.008	.121	-.055	.044	.051	-.020	1.000
Sig. (1-tailed)	STI.LOUD	.	.481	.466	.245	.201	.322	.163	.109
	HEARING	.481	.	.046	.044	.255	.206	.315	.477
	DOFE	.466	.046	.	.034	.073	.000	.300	.184
	NS	.245	.044	.034	.	.044	.000	.086	.342
	PRIVACY	.201	.255	.073	.044	.	.446	.020	.372
	ENVIROAW	.322	.206	.000	.000	.446	.	.126	.353
	ACCEPT	.163	.315	.300	.086	.020	.126	.	.440
	AGE	.109	.477	.184	.342	.372	.353	.440	.
N	STI.LOUD	58	58	58	58	58	58	58	58
	HEARING	58	58	58	58	58	58	58	58
	DOFE	58	58	58	58	58	58	58	58
	NS	58	58	58	58	58	58	58	58
	PRIVACY	58	58	58	58	58	58	58	58
	ENVIROAW	58	58	58	58	58	58	58	58
	ACCEPT	58	58	58	58	58	58	58	58
	AGE	58	58	58	58	58	58	58	58

		STI.SHOU	HEARING	DOFE	NS	PRIVACY	ENVIROAW	ACCEPT	AGE
Pearson Correlation	STI.SHOU	1.000	.046	.024	.064	-.150	.056	.077	.192
	HEARING	.046	1.000	.223	-.226	.088	-.110	-.065	-.008
	DOFE	.024	.223	1.000	.241	.194	.529	.070	.121
	NS	.064	-.226	.241	1.000	.225	.429	.182	-.055
	PRIVACY	-.150	.088	.194	.225	1.000	.018	.270	.044
	ENVIROAW	.056	-.110	.529	.429	.018	1.000	.153	.051
	ACCEPT	.077	-.065	.070	.182	.270	.153	1.000	-.020
	AGE	.192	-.008	.121	-.055	.044	.051	-.020	1.000
Sig. (1-tailed)	STI.SHOU	.	.367	.428	.318	.130	.339	.284	.074
	HEARING	.367	.	.046	.044	.255	.206	.315	.477
	DOFE	.428	.046	.	.034	.073	.000	.300	.184
	NS	.318	.044	.034	.	.044	.000	.086	.342
	PRIVACY	.130	.255	.073	.044	.	.446	.020	.372
	ENVIROAW	.339	.206	.000	.000	.446	.	.126	.353
	ACCEPT	.284	.315	.300	.086	.020	.126	.	.440
	AGE	.074	.477	.184	.342	.372	.353	.440	.
N	STI.SHOU	58	58	58	58	58	58	58	58
	HEARING	58	58	58	58	58	58	58	58
	DOFE	58	58	58	58	58	58	58	58
	NS	58	58	58	58	58	58	58	58
	PRIVACY	58	58	58	58	58	58	58	58
	ENVIROAW	58	58	58	58	58	58	58	58
	ACCEPT	58	58	58	58	58	58	58	58
	AGE	58	58	58	58	58	58	58	58

		DBA	STI.NORM	STI.RAIS	STI.LOUD	STI.SHOU
Pearson Correlation	DBA	1.000	-.961	-.985	-.994	-.941
	STI.NORM	-.961	1.000	.994	.927	.812
	STI.RAIS	-.985	.994	1.000	.961	.868
	STI.LOUD	-.994	.927	.961	1.000	.972
	STI.SHOU	-.941	.812	.868	.972	1.000
Sig. (1-tailed)	DBA	.	.000	.000	.000	.000
	STI.NORM	.000	.	.000	.000	.000
	STI.RAIS	.000	.000	.	.000	.000
	STI.LOUD	.000	.000	.000	.	.000
	STI.SHOU	.000	.000	.000	.000	.
N	DBA	60	60	60	60	60
	STI.NORM	60	60	60	60	60
	STI.RAIS	60	60	60	60	60
	STI.LOUD	60	60	60	60	60
	STI.SHOU	60	60	60	60	60

		V13	STI.NORM	STI.RAIS	STI.LOUD	STI.SHOU
Pearson Correlation	V13	1.000	.183	.222	.311	.368
	STI.NORM	.183	1.000	.994	.926	.809
	STI.RAIS	.222	.994	1.000	.961	.866
	STI.LOUD	.311	.926	.961	1.000	.971
	STI.SHOU	.368	.809	.866	.971	1.000
Sig. (1-tailed)	V13	.	.082	.046	.008	.002
	STI.NORM	.082	.	.000	.000	.000
	STI.RAIS	.046	.000	.	.000	.000
	STI.LOUD	.008	.000	.000	.	.000
	STI.SHOU	.002	.000	.000	.000	.
N	V13	59	59	59	59	59
	STI.NORM	59	59	59	59	59
	STI.RAIS	59	59	59	59	59
	STI.LOUD	59	59	59	59	59
	STI.SHOU	59	59	59	59	59

G.3. *Demographic Correlations*

		ACCEPT	AGE	SEX
Pearson Correlation	ACCEPT	1.000	.031	-.139
	AGE	.031	1.000	-.191
	SEX	-.139	-.191	1.000
Sig. (1-tailed)	ACCEPT	.	.325	.021
	AGE	.325	.	.003
	SEX	.021	.003	.
N	ACCEPT	214	214	214
	AGE	214	214	214
	SEX	214	214	214

		V16	AGE	SEX
Pearson Correlation	V16	1.000	.044	.152
	AGE	.044	1.000	-.192
	SEX	.152	-.192	1.000
Sig. (1-tailed)	V16	.	.263	.013
	AGE	.263	.	.003
	SEX	.013	.003	.
N	V16	211	211	211
	AGE	211	211	211
	SEX	211	211	211

(a) Bars

		DOFE	HEARING
Pearson Correlation	DOFE	1.000	.218
	HEARING	.218	1.000
Sig. (1-tailed)	DOFE	.	.028
	HEARING	.028	.
N	DOFE	78	78
	HEARING	78	78

(b) Cafes

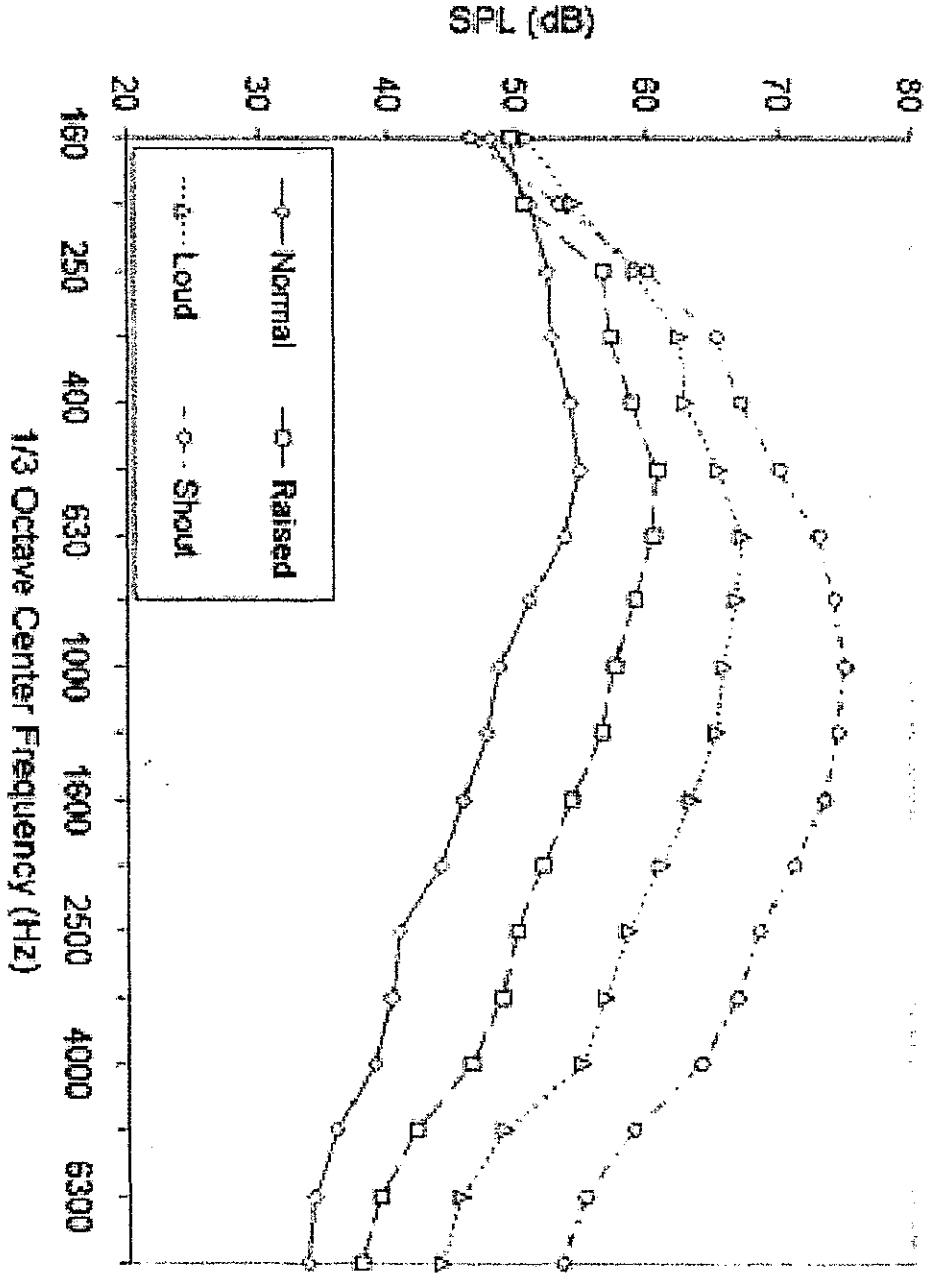
		DOFE	HEARING
Pearson Correlation	DOFE	1.000	-.011
	HEARING	-.011	1.000
Sig. (1-tailed)	DOFE	.	.462
	HEARING	.462	.
N	DOFE	79	79
	HEARING	79	79

(c) Restaurants

		DOFE	HEARING
Pearson Correlation	DOFE	1.000	.223
	HEARING	.223	1.000
Sig. (1-tailed)	DOFE	.	.046
	HEARING	.046	.
N	DOFE	58	58
	HEARING	58	58

Appendix H

~ ANSI Speech Level Curves 53.5 (1997)



BBSC 389 – INDEPENDENT STUDY (2004):

Acoustics in the Hospitality Industry

Assignment 2 – Brief

Hypothesis:

That bar, restaurant and café settings in general, do not provide a suitable level of acoustic support for social interaction.

Aims:

- Measure the acoustic environment from both an objective and subjective viewpoint.
- Analyse these findings appropriately on both a statistical and literary level to obtain a justifiable argument and conclusion.

Process:

- Measure the chosen environments by distributing the survey and taking physical measurements of the acoustics.
- Statistically analyse the data gathered, presenting results in numerous forms as appropriate to represent and convey the relationships discovered.
- Produce a report of the findings, including an explanation of the methodology, results and a discussion.

Objectives:

This assignment will provide the opportunity to learn and demonstrate these abilities to:

- Approach related parties with appropriate social skills and etiquette to inform them of our research.
- Measure and record the acoustic properties of the environment using winMLS (an acoustic analysis software programme) and other necessary equipment.
- Collect, collate and analyse data in a coherent method, and be able to interpret this data appropriately.
- Report and summarise findings, and establish the relationship between the subjective and objective factors affecting speech intelligibility or acoustic comfort.
- Discuss the findings relative to past research and the hypothesis, and what this implies about bar, restaurant and café acoustic environments.

Submission:

Submission will be in the form of –

- An A4 written and visual report comprising approximately 5000 words.
  The written report will include:
  - a detailed explanation of the methodology, including issues and assumptions that were made
  - results section, presenting a statistical summary of the data obtained
  - an index/model that can be used for future prediction of an environments acoustic conditions
  - a discussion, including comments on the limitations of the design, relationship to past research, implications and applications of the findings, and summary conclusions.

Assignment 2 is worth **40%** of the papers total marks and is due to be submitted on **Friday the 8th of October.**

Assessment:

Overall A-

CRITERIA	RATINGS AND COMMENT				
	Outstanding	Very Good	Good	Satisfactory	Unsatisfactory
Quality of data collection and measurement	(A+) A	A- B+	B B-	C+ C	D E
Quality and understanding of analysis of results	A+ A	A- (B+)	B B-	C+ C	D E
Quality of report and summary of findings, relating the subjective and objective factors appropriately	A+ A	(A-) B+	B B-	C+ C	D E
Quality of discussion of the Findings and their wider implications	A+ A	(A-) B+	B B-	C+ C	D E

You seem to be lost still.
This report needed more cross reference to the previous report. It also needed a better description of the Factor Analysis and, most importantly, to be half this length.
The effort you have gone to in learning about, researching the literature, & understanding the appropriate state for this analysis is herculean & of very high standard. Representing the information you have found in a digestible package in a report has clearly been a struggle: you have ended up reporting the 'how' better than the 'what' of the project. A list of the questions in summary/issue form then a list of their "Factor Analysis" groupings by type & overall & then a listing of these groupings' correlations with measured data are what would have helped this reader's understanding of the results