

## Attitudes of Population towards Traffic Noise in Saudi Arabia, Dammam: A Case Study

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**Abstract:** Noise pollution can result from number of sources, including traffic, construction and industrial activities. Motorboats, snowmobiles; and loud music are also considered sources of noise pollution. Traffic noise affects people in different manners such as rest annoying disorders, stress and learning troubles, in addition to cardio-vascular diseases. The present study is mainly aimed to investigate the attitude of Saudi population towards the environmental noise pollution. Population of Dammam city in the Eastern Province of Saudi Arabia was selected as a case study due to its nature of industrial, commercial, educational and recreational human activities. The survey method chosen for this study was a direct interview using a pre-designed questionnaire. A hundred percent of respondents reported that traffic activity was the most annoying source of environmental noise and more than 80% of respondents were generally complain from the traffic noise with a degree of annoyance ranged from moderate to sever. Sleeping and performance of jobs were the most affected daily activities with traffic noise. The highest percent of respondents reported that the day period (from 7:00 am to 7:00 pm) is the maximum period of exposure to the traffic noise. Most of respondents were closing their doors and windows to avoid annoyance of the outdoor noise, while others were going away to calm areas, blame the noise-causing persons or speaking loudly to overcome this problem. There is a weak significant statistical correlation between age of respondent and sleep disturbance due to exposure to the traffic noise.

**Key words:** Noise Pollution; Traffic Activity; Attitudinal Survey; Respondents; Annoyance; Sleeping Disturbance.

### INTRODUCTION

Noise is often described as an undesirable sound that annoys people, interferes with communication, disturbs sleep or rest or causes hearing loss. Noise pollution can come from number of sources, such as transportation, construction industrial activities, motorboats, snowmobiles and loud music. (1-4)

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While the risk of hearing loss from outdoor noise is negligible in people who do not work with loud equipment on a regular basis, it is possible to suffer from temporary hearing loss from such noises. Traffic noise affects people in different manners such as sleeping disorders, stress and troubles learning. Furthermore, new studies show that noise can contribute to an increased risk of cardio-vascular diseases. More importantly, noise can cause stress. Like other sources of stress, it can temporarily affect the heart rate, blood flow and may also affect the immune system and the biochemistry of the blood. The effects of noise are also of an economic nature in that they influence housing prices in noisy areas. Furthermore, health related issues caused by noise also incur costs. <sup>(5-9)</sup>

In recent years, increasing traffic flow on the nation's roads coupled with growing awareness of environmental issues have established the need to

evaluate the traffic noise impact of new or existing roads on neighboring communities. Several social surveys have been conducted in different Arab and foreign countries to examine the attitude of population toward the neighbor and neighborhood noise. All of these surveys were based on direct interview using a pre-designed questionnaire with representative samples of population. <sup>(10-12)</sup> one of these studies was done in Canada in 2002 on a sample composed of 2667 persons through phone interviews. A percent of 51% of the interviewed population indicated that they were affected by the environmental noise, particularly traffic noise, with different degrees ranged from low to sever. <sup>(13)</sup>

Another social survey study was conducted on the Greater Cairo in Egypt during the year 2003. A total of 1000 questionnaires were distributed by hand where the respondents were completing the questionnaire by themselves and returned it to the distributors. This study

indicated that about 82% of respondents were annoyed by road traffic noise, particularly noise result from buses and heavy vehicles. In addition, about 53.5% of the interviewed people declared to be “highly annoyed”, while only 9.1% declared to be “little annoyed”.<sup>(14)</sup>

Al-Dakhlallah and Jadaan conducted a similar study in Jordan during the year 2005. The social survey chosen was a direct interview using questionnaires, completed during a home interview with 300 households. Data analysis indicated the seriousness of the problem; since 70% of respondents reported that they were affected by traffic noise always or most of the time. In addition, more than half of all respondents think of changing their place of residence.<sup>(15)</sup>

Reviewing of the literatures showed that there is a lack of data concerning with the effect of traffic noise on the KSA population. The present study is mainly aimed to bridge this gap and to investigate

the attitude of Saudi population towards the environmental noise pollution. Population of Dammam city in the Eastern Province of Saudi Arabia was selected as a case study. This selection is mainly due to its multiple human activities such as industrial, commercial, educational and recreational activities.

## **METHODOLOGY**

According to similar previous studies in different countries of the world, the survey method chosen for collecting data in this study was a direct interview using a pre-designed questionnaire.<sup>(16-18)</sup>

### **2.1. Design of the Questionnaire**

For accurate collection of data, a questionnaire was designed with a total of seventeen straight-forward questions with multiple choice answers for each question. The seventeen questions were divided into the following five items:

#### **Item 1: Demography of Respondents**

This item contain six questions including the respondent's name, age, job,

the reason of presence in the study location, nature of traffic activity in the street in which he lives or works, and the total period which he spent in this street.

### **Item 2: Sources of Environmental Noise**

This item contains three questions, which were concerned with the common sources of environmental noise in the surrounding area of the respondent, in addition to the type and degree of complaint from these sources.

### **Item 3: Adverse Effects of Environmental Noise**

This item contains two questions. These questions were the most adversely affected daily personal activities and the degree of this effect.

### **Item 4: Exposure Periods to Environmental Noise**

This item contains two questions that dealing with the daily and weekly periods during which the respondent was exposed to the highest noise levels.

### **Item 5: Methods of Avoiding**

### **Environmental Noise**

This item contains only one question. It was designed to include all possible methods that respondent was expected to follow for avoiding the surrounding environmental noise pollution.

### **2.2. Collection of Data**

After designing the questionnaire, a pilot study was conducted on a random sample of respondents to test the applicability and suitability of the questionnaire for rapid and easy collection of the required data. Determination of the total time needed to complete filling a questionnaire was a main target from this pilot study. It was found that the average needed time was 25-30 minutes for each questionnaire.

Six main streets were selected for this study in Dammam city during the period from March to January to June 2008. These streets were; King AbdulAziz street, King Saud street, King Fahd street, street No. 18, street No. 28 and street No. 42. In

each one of these streets, 25 questionnaires were filled using face-to-face interview with people living or working in it. The total number of respondents was 150.

### **2.3. Questionnaire Analysis Methodology**

Data entry and analysis of all questionnaires were conducted using SPSS-17 package, and Microsoft Office Excel-2007. Graphical presentation of data was carried out using Microsoft Office Excel-2007. An analysis was based on handling of each question in the questionnaire separately. This method of analysis was also considered for similar studies worldwide.<sup>(17-21)</sup> In addition paired samples test and paired samples correlation coefficient were conducted

## **RESULTS & DISCUSSION**

### **3.1. Demography of Respondents**

Figures (1) to (4) represent answers of the respondents to questions of this item. It was noted that the highest percent of all

respondents (93%) had ages ranged from 16 to 45 as illustrated in figure (1A), and more than half of this percent (51%) had ages ranged between 26 and 35 years as shown in figure (1B). This means that the majority of respondents were in the youth stage of life, which is characterized by high levels of intelligence, awareness, and productivity.

On the other hand, studying reasons of respondent's presence in the study locations indicated that more than 70% of them reported that the study location is the area of their daily working activities. Other respondents (14.7%) were present as inhabitants, in addition, 1.3% live and work in study area as indicated in figure (2). This means that the three categories are exposed daily to the noise levels in the study locations. Hence they are greatly affected by environmental noise.

In addition, high percent of respondents (60%) decided that they were

suffering from dense traffic as illustrated in figure (3). While 38% of the total respondents were living and/or working in the streets under study for long times (over 5 years) as shows in figure (4). These information reflect the accuracy and confidence of the research data because most of it were collected from the youth respondents who were surrounded by heavy noise sources for a long time, and logically, they were the most representative sample of respondents able to describe the problem and effectively answer the questions.

### **3.2. Sources of Environmental Noise**

Respondents' Answers on questions dealing with sources of the surrounding environmental noise and their adverse effects are illustrated in figures (5) to (7). It is clear that 100% of respondents reported that traffic activity was the most annoying source of environmental noise, followed by noise emitted from movement and conversation of people (68%). Figure (7)

indicates that a total of 23% of respondents decided that noise in the study areas ranged from very low to low. This may be due to acclimatization. While 35% stated that noise in the study areas were moderate. Also, 24% described noise as high and very high. Whereas, 15% of respondents reported that noise is too high to be tolerated. These data confirm the fact that traffic activity is considered one of the most dangerous sources of environmental noise, particularly in urban cities as reported by a lot of researches and studies.<sup>(22-23)</sup>

### **3.3. Adverse Effects of Environmental Noise**

The degree of adverse effects from respondent's exposure to traffic noise was identified by three questions. Answers of these questions are presented in figures (8) to (10). It is evident that sleeping and performance of jobs were the most affected daily activities with traffic noise (49% and 45% respectively) as illustrated in figure

(8). A percent of 42% of total respondents reported that traffic noise prevent them from the calmness which is needed for good sleeping. In addition, 28% of respondents stated that this type of noise leads to loss of concentration during conducting their daily works as shown in figure (9). However, a total of 70% of respondents decided that annoyance was the main and collective adverse effect from the traffic noise as indicated in figure (10) . The same results and conclusion have been obtained from several studies on traffic noise effects in different areas of the world.<sup>(25-27)</sup>

### **3.4. Exposure Periods to Environmental Noise**

Figures (11) to (12) indicate answers of questions concerning the daily and weekly periods during to which respondents were exposed to environmental noise levels higher than other periods. The highest percent of respondents (45%) reported that the day

period (from 7:00 am to 7:00 pm) is the period during which they are greatly affected by exposure to environmental noise, particularly traffic noise. A slightly lower percent (42%) selected the evening period (from 7:00 pm to 11:00 pm), while the lowest percent (16%) referred to the night period (from 11:00 pm to 7:00 am) as clear in figure (11). As for weekly days, a higher percent of respondents (33%) decided that they are greatly affected by traffic noise during workdays (Saturday – Thursday), while lower percent (19%) reported the contrary attitude as illustrated in figure (12). These observations are in full consistency with the traffic pattern in Dammam City, where the traffic intensity has its maximum level during the first morning rush hour period, followed by the second and third rush hour periods during noon and evening, while the lowest traffic density is recorded during the night period. These results are compatible with the results of another study that was done in

Jeddah and Riyadh Cities of KSA <sup>(18)</sup>.

On investigating public opinion about noise in the city, the results indicated that outdoor noise due to traffic represents the first major invader that threatens the acoustic quality in Dammam. The results also indicated that about 50% of interviewed people were affected by noise through sleeping interference. This percent was higher in Jeddah and Riyadh cities <sup>(19)</sup>. One of the important recommendations of Jeddah and Riyadh study was the urgent need to reduce noise levels, particularly those due to traffic in both cities. As a conclusion, any city similar to Dammam, Jeddah and Riyadh in the Kingdom of Saudi Arabia, surely has the same noise pollution problem due to dense traffic activity.

### **3.5. Methods of Avoiding Environmental Noise**

Action of the respondents to avoid the traffic noise pollution is presented in figure (13). The highest percent of respondents

(59%) were closing their doors and windows to prevent or minimize levels of the neighborhood environmental noise. The other had another methods including moving away to a calm areas, talking with the noise-causing persons and speaking loudly to overcome the surrounding traffic noise. A considerable percent of respondents (~ 30%) were not care with the problem and hence, they didn't take any action. This may be due to acclimatizing themselves.

### **3.6. Correlation between all Questionnaire Items**

Aiming at assessing the correlation between respondents' ages and effects of exposure to noise paired samples Correlation Coefficients between age groups and these effects were considered as shown in table (1). It is clear that the correlation coefficient between age and sleeping disturbance and loss of concentration due to exposure to environmental noise are weak and

significant. Also Paired Samples t-test show highly significant variation of various effects of exposure to noise and age at 0.005 levels, except in case of health effects that shows non-significant variation with age as clear in table (2). This non-significant variation in health effects due to exposure to noise may be due to the low number of respondents(n=10) above 45 years old.

#### **4. Conclusion and Recommendation**

Dammam and similar cities in KSA exhibit adverse environmental and personal changes due to traffic noise that directly affect work activities, sleeping pattern and communication between population. In view of the findings of this

study an effective attenuation noise levels is recommended. In addition, the attention and interest should be given to the researches concerning with the environmental pollution in the big and crowded cities in the Kingdom that are considered databases for the decision makers to improve the environment and protect peoples from the adverse effects of noise and other environmental pollution.

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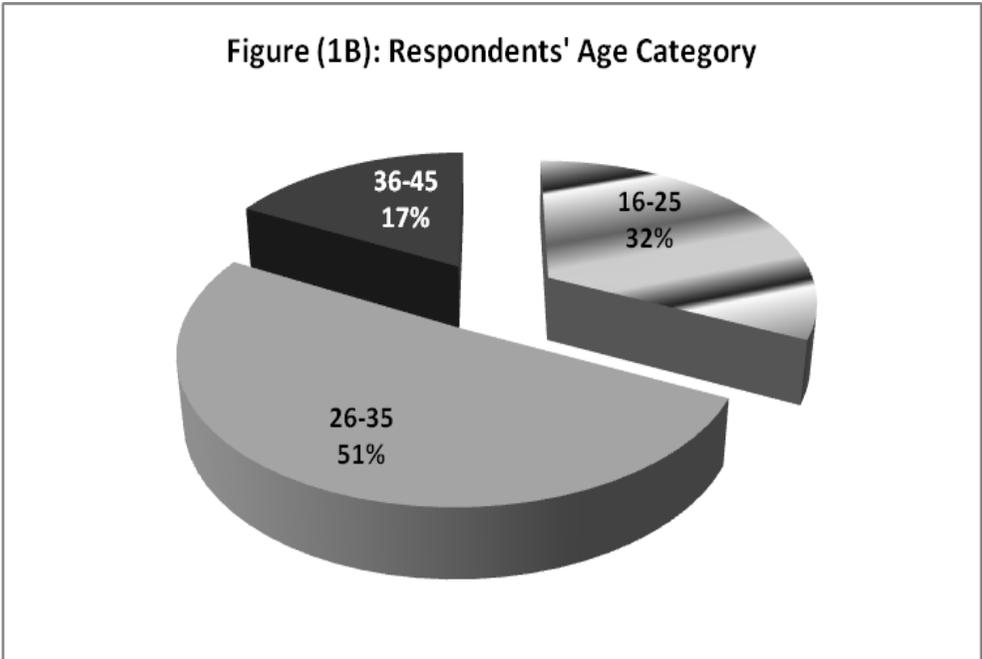
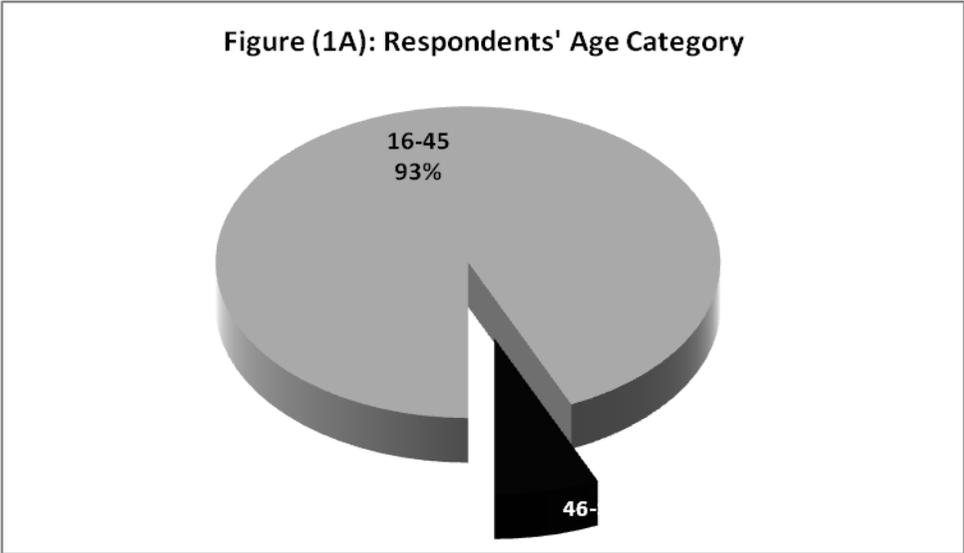
**Table (1): Paired Samples Correlation Coefficients between Age Groups and Negative Impacts of Exposure to Noise**

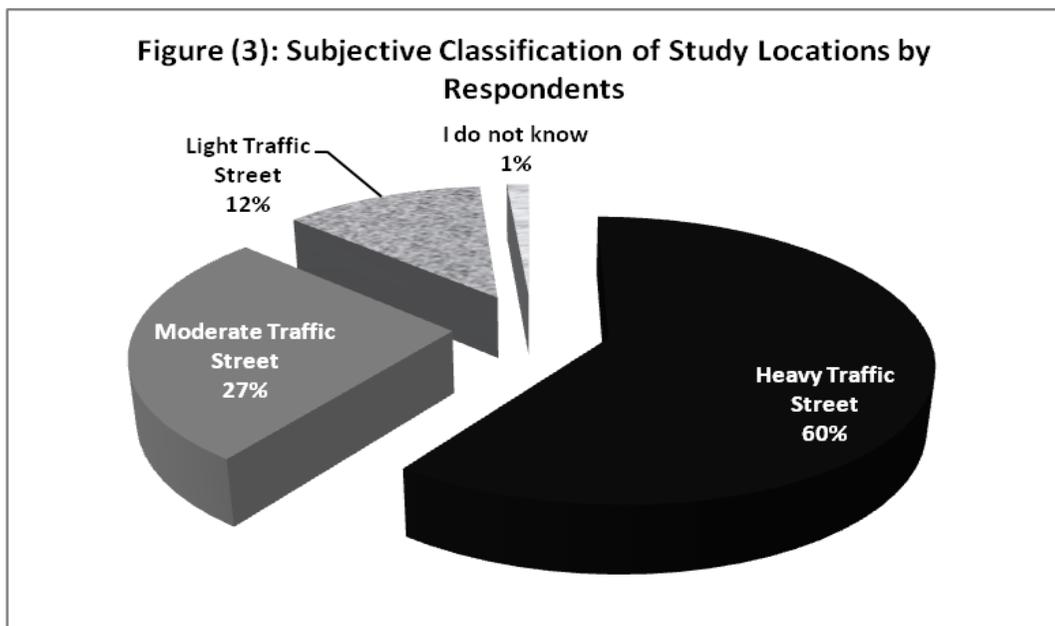
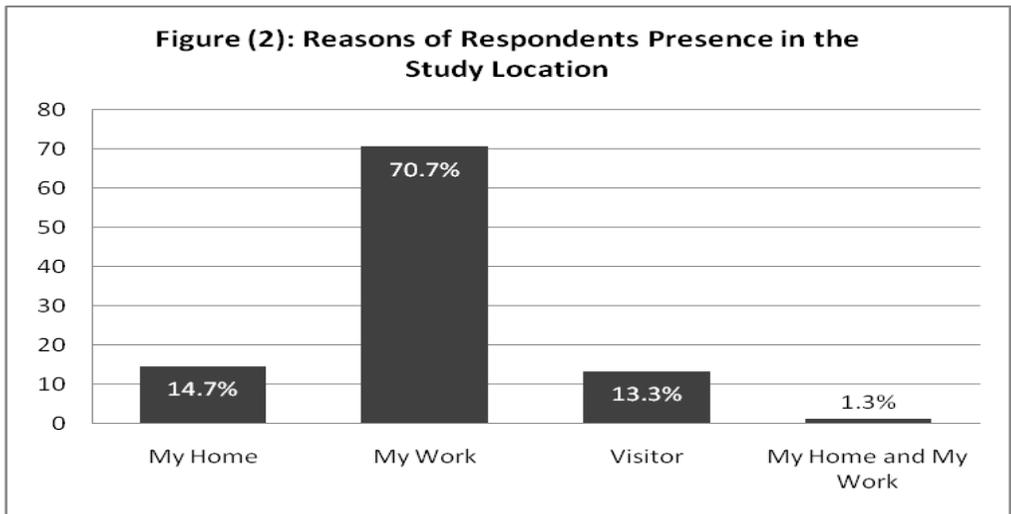
	<b>N</b>	<b>Correlation</b>	<b>Sig.</b>
Age & sleeping disturbance	150	.195	.017*
Age & daily Working activities	150	-.112	.174
Age & loss of concentration	150	.183	.025*
Age & Fatigue sensation	150	.059	.473
Age & Health Effects	149	.035	.676
Age & Irritability	150	.128	.118
Age & anxious	150	-.121	.139

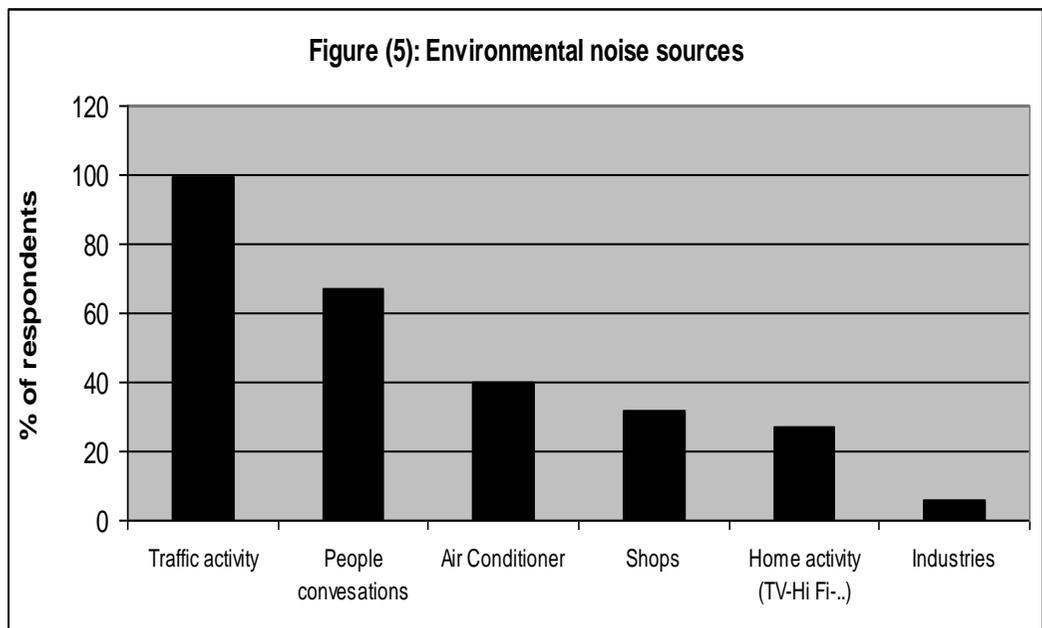
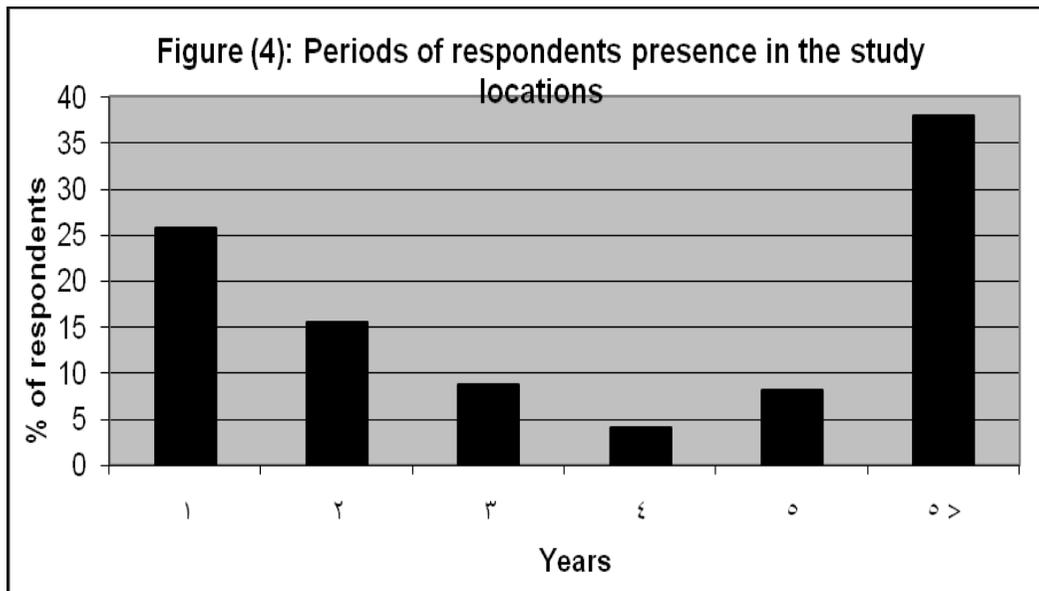
\* Significant correlation coefficient at 0.05 levels.

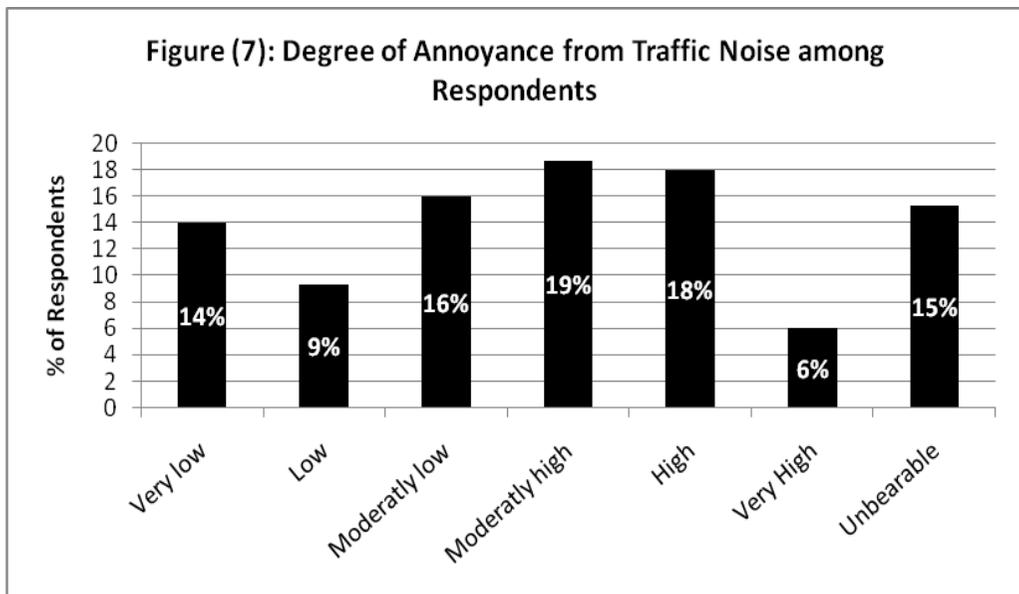
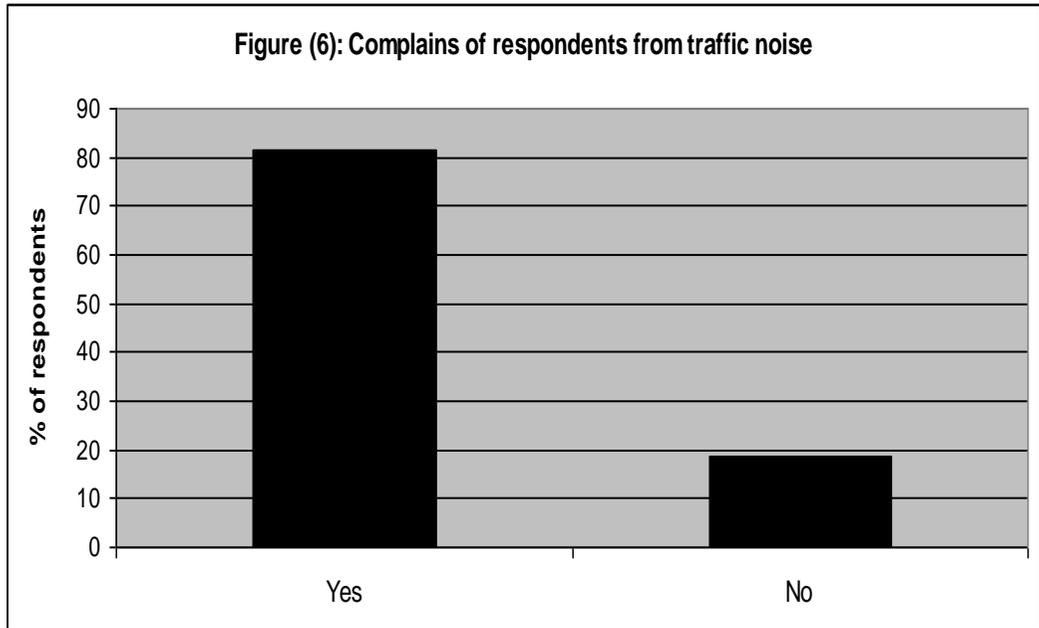
**Table (2): Paired Samples T- Test of Age of respondents and effects of exposure to noise in study locations**

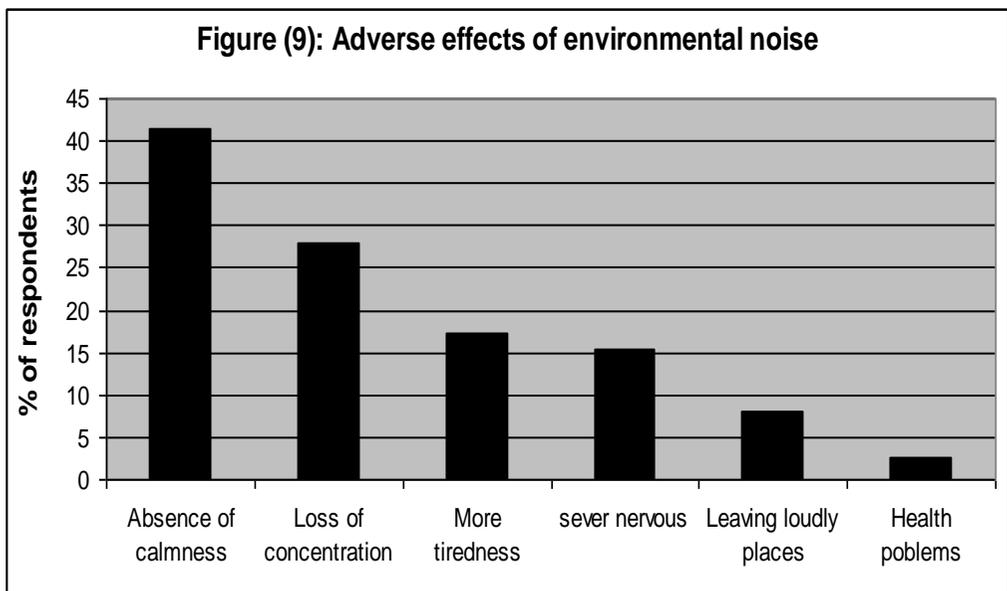
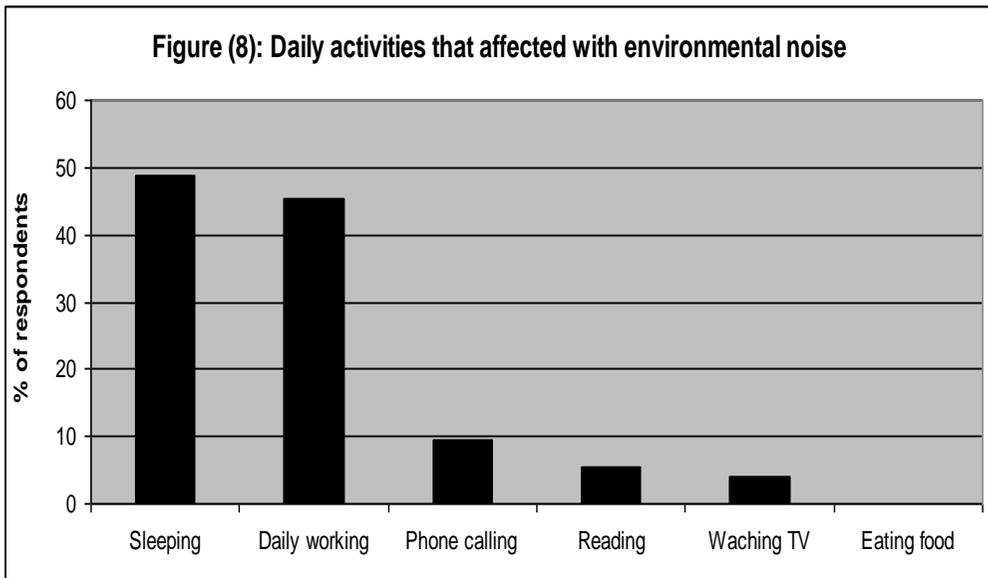
	<b>t</b>	<b>df</b>	<b>Sig. (2-tailed)</b>
Age - Sleeping	6.841	149	.000
Age – Daily Working Activities	5.371	149	.000
Age - loss of concentration	7.978	149	.000
Age - Fatigue	2.724	149	.007
Age - Loss of Calm	4.647	149	.000
Age - Health Effects	.695	148	.488
Age - Irritability	2.466	149	.015
Age - anxious	4.699	149	.000

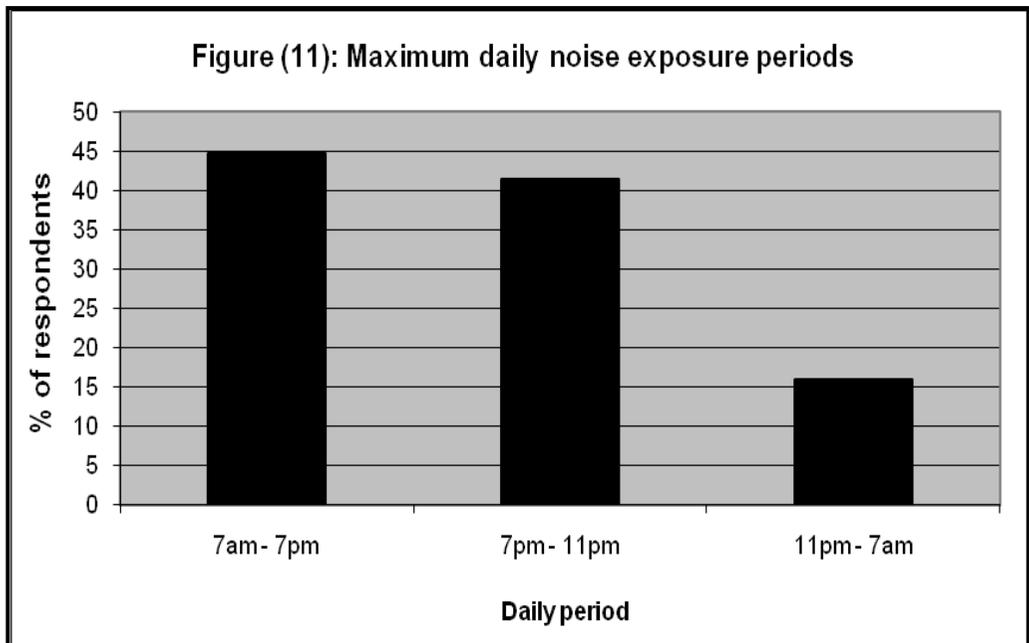
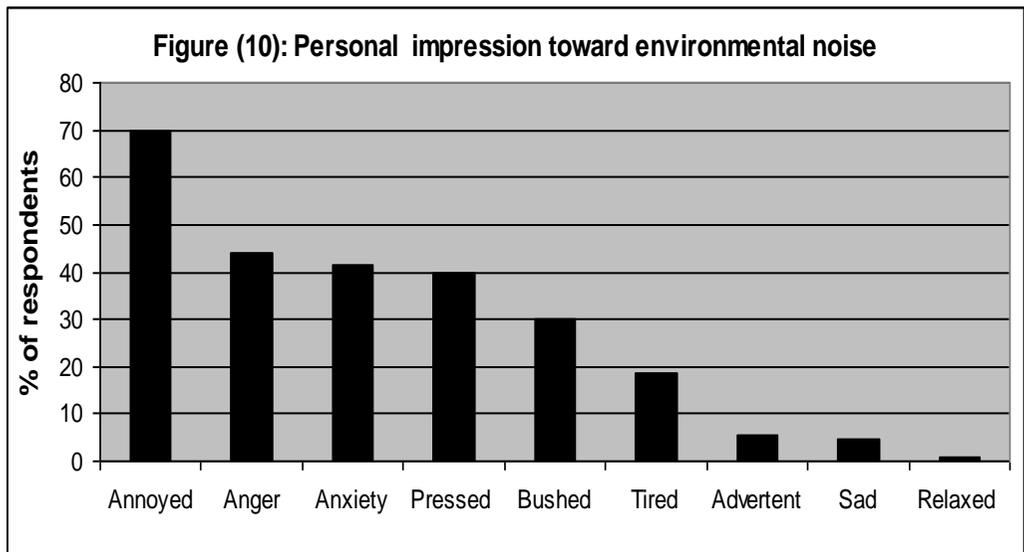


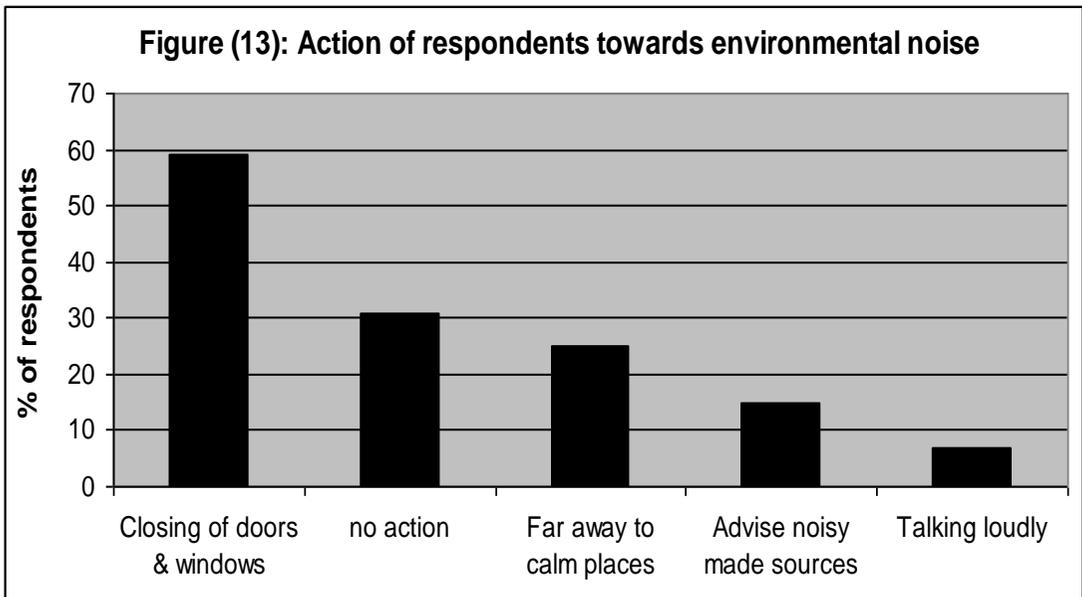
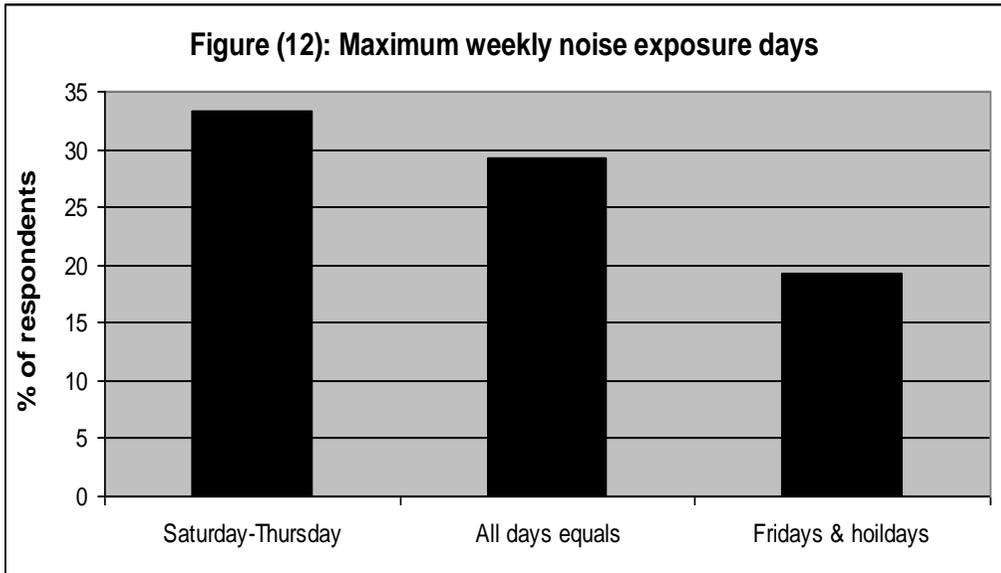












**REFERENCES**

1. McDaniel J, Thill MS. Environmental Noise Assessment. Illingworth & Rodkin, Inc, California, 2008.
2. Ohrstrom E, Skanberg A, Svensson H, Gidlof A. Effects of road traffic noise and the benefit of access to quietness. *Journal of Sound and Vibration*, 2006; 295: 40–59.
3. Yusoff S, Ishak A. Evaluation of Urban Highway Environmental Noise Pollution. *Sains Malaysiana*, 2005; 34(2): 81-87.
4. Godish T. Air Quality, 4th Edition, Lewis Publishers, USA, 2004.
5. Reinhard B, Raggam RB, Cik M, Idrich R, Fallast K, Gallasch E, Fend M, Lackner A, Marth E. Personal noise ranking of road traffic: Subjective estimation versus physiological parameters under laboratory conditions. *Int. J. Hyg. Environ.-Health*, 2007; 210: 97–105.
6. Griefahn B, Marks A, Robens S. Noise emitted from road, rail and air traffic and their effects on sleep, *Journal of Sound and Vibration*; 2006; 295: 129–140.
7. Muzet A. Environmental noise, sleep and health, *Sleep Medicine Reviews*, doi: 10.1016/j.smrv.2006.09.001, 2007.
8. Babisch W. Noise and health. *Environ Health Perspect*, 2005; 113 (1): A14–A15.
9. Rocha C, Carvalho A. Urban planning and traffic noise in Portugal: How did we get here?, *Transport Research Arena Europe*, 2006.
10. Ling M, Skinner C, Grimwood C, Raw G. The 1999/2000 National Survey of Attitudes to Environmental Noise - Volume 1 Methodology. Department of the Environment for Northern Ireland, 2002.
11. Neitzel R, Seixas N, Goldman B, Daniell W. Contributions of Non-occupational Activities to Total Noise Exposure of Construction Workers. *Ann. occup. Hyg.*, 2004; 48 (5): 463–473.
12. Howarth HVC, Griffin MJ. A Social Survey Questionnaire of Human Responses to Vibration in Residential Buildings. Institute Of Sound and Vibration Research, University of Southampton, ISVR Technical Report No 323, October 2008.
13. IBM Business Consulting Services. Traffic Noise Outside the Home. *HealthInsider: POR-02-65-S*, Canada, 2002.
14. Ali S, Tamura A. Road traffic noise levels, restrictions and annoyance in Greater Cairo, Egypt, *Applied Acoustics*, 2003; 64: 815–823.
15. Al-Dakhlallah AN, Jadaan KS. Attitudes of Jordanian Population towards Road Traffic Noise. *International Journal of Applied Science and Engineering*; 2005; (3) 2: 145-150.
16. Fyhri A, Klæboe R. Direct, indirect influences of income on road traffic noise annoyance, *Journal of Environmental Psychology*, (2006); 26: 27–37.
17. Bronzaft A, Van Ryzin G. Neighborhood Noise and its Consequences. Survey Research Unit, School of Public Affairs, Baruch College, New York, 2004.
18. Ipsos MORI Social Research Institute. National Noise Survey., J26736: National Society for Clean Air and Environmental Protection (NSCA), Great Britain, 2006.
19. Elshorbagy KA. Noise and Community Response in Jeddah and Riyadh Cities, *JKAU: Met., Env., Arid Land Agric. Sci.*, 1999;10: 87-99.

20. Grimwood CJ, Skinner CJ., Raw GJ. the UK National Noise Attitude Survey 1999/2000, BRE, Noise Forum Conference, London, 2002.
21. Klæboe R, Amundsen A, Fyhri A, Solberg S. Road traffic noise—the relationship between noise exposure and noise annoyance in Norway, *Applied Acoustics*, 2004; 65: 893–912.
22. Kassomenos P, Karakitsios S, Papaloukas C. Estimation of daily traffic emissions in a South-European urban agglomeration during a workday. Evaluation of several “what if” scenarios. *Science of the Total Environment*, 2006; 370: 480–490.
23. Filho JM, Lenzi A, Zannin PH. Effects of traffic composition on road noise: a case study, *Transportation Research Part 2004*; D 9: 75–80.
24. Bluhm G, Nordling E, Berglind N. Road traffic noise and annoyance – an increasing environmental health problem. *Noise Health*, 2004; 6: 43–49.
25. Ouis, D. Annoyance caused by exposure to road traffic noise: an update. *Noise Health*, 2002; 4: 69–79.
26. Ohrstrom, E. Longitudinal surveys on effects of changes in road traffic noise—Annoyance, activity disturbances and psycho-social well being. *Journal of Acoustical Society of America*, 2004; 115: 719–729.