

FACTORS AFFECTING ROAD TRAFFIC NOISE ANNOYANCE AMONG WHITE-COLLAR EMPLOYEES WORKING IN TEHRAN

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Received 3 March 2009; revised 20 November 2009; accepted 20 December 2009

ABSTRACT

The effect of personal and attitudinal factors, noise level, hearing status and psychological traits on traffic-related noise annoyance among white-collar employees working in Tehran has been carefully analyzed. This survey has been conducted by interviewing 495 citizens working in non-manufacturing industries in Tehran, using questionnaires, Weinstein noise sensitivity scale, Beck's depression, Buss and perry's aggression, Zung's anxiety, job satisfaction and Eysenc's personality inventory. These citizens were office workers or store employees. Noise annoyance was determined both by numerical-based questionnaire criterion and by verbal index. Personal information, attitudinal factors and hearing conditions were determined using a general questionnaire. The amount of workplace noise the participants were exposed to was directly measured at their workplaces. It was revealed that among personal factors, age ($p=0.030$), marital status ($p=0.004$), residential period ($p=0.001$) and wealth ($p=0.04$) were related to noise annoyance. Attitudinal factors including sensitivity to noise ($p=0.001$), individual's opinion on the need to control the noise ($p=0.000$) and individuals' assessment of the amount of the workplace ambient noise ($p=0.000$) were found to have relationship with noise annoyance. No meaningful relationship was seen between the equivalent noise level ($p=0.879$) and statistical noise level of L90 ($p=0.909$). The present study revealed that among all effective factors involved in noise annoyance, attitudinal factors had the most significant role in this regard.

Key words: Noise annoyance, Road traffic noise, Personal traits, Attitudinal factors

INTRODUCTION

Ambient noise especially caused by road traffic is a major factor annoying city dwellers. The transportation-related noise does not only influence those who actually use the transportation system but also affects the quality of life and activities of those who are exposed to such noise. According to the present model regarding the method describing the impact of noise on humans and the society, noise may cause 'immediate effects' including sleep, mental concentration, and aural communications disturbances, as well as retarding reactions or noise annoyance (Nelson, 1987). The verified definition of noise annoyance is "a feeling of displeasure associated with noise

believed to affect adversely an individual or a group" (Lindvall *et al.*, 1973). On the other hand, noise annoyance is defined typically as "the overall unwantedness of a noise and includes not only the unwantedness of the noise itself but also many other variables relating to the source and the context in which it is experienced" (Yano, 2002). Based on above mentioned model, noise annoyance is under the influence of individual and attitudinal factors, noise level, and immediate effects of noise.

It has been found demographic factors such as age, sex, and socioeconomic factors can not explain the difference in annoyance between individuals, separately (Ohrstrom *et al.*, 1988). A study conducted by Williams and McCare

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on residents of residential and business areas of London, Birmingham, Cardiff, Coventry, Edinburgh, and Sheffield, revealed that noise annoyance among people employed (37%-59%) was more in comparison with people who stayed at home (25%-48%). The extent of noise annoyance in men was found to be more than that in women, and this amount has been reported to be more among employed people within 45-64 age group than among younger or older age groups (Williams and McCrae, 1995).

In several studies conducted on relationship between noise annoyance and personality no clear-cut results were found (Broadbent, 1972). Several studies have also been conducted on the relationship between noise annoyance and personal traits. Studies show that the relationship between extroversion/introversion and annoyance caused by noise is entirely significant and meaningful (Raw and Griffiths, 1988). A case study conducted by Belojevic (1997) on traffic related noise and its impact on 413 residents of central Belgrade showed that the degree of sensitivity to noise and the noise level are the most notable factors involved in noise annoyance. The study also showed that there is a positive relationship between noise level and nervousness ($p<0.05$), fatigue ($p<0.01$), depression ($p<0.01$) and headache ($p<0.05$).

It seems that noise annoyance is affected by six most reported attitudinal factors. This relationship has been suggested by a number of other studies; however, it has not been repeatedly tested (Nelson, 1987). It sometimes has been argued that the findings about relationship between noise annoyance and attitudinal factors show that annoyance is actually caused by these attitudes. In other words, conclusion can not be drawn about the direction of causation.

The present study was conducted on white-collar employees in Tehran. Tehran is a large city (over 13,328,000 inhabitants) located in north of Iran. According to last census conducted in 1992, the number of white-collar employees in Tehran was about 1,300,000 (Ministry of Health, 1990). Several studies have been conducted on the relationship between the noise level and noise annoyance in Tehran. A study conducted in Tehran showed that noise level in working day

was 75.63 and 81.20 in terms of Leq and L10, respectively; and %59.8 of people assessed the noise as annoying (Shalchian, 1995). Another study revealed a significant relationship between the occurrence of occupational attrition and the degree of noise annoyance ($p<0.001$) and marital status ($p<0.001$) (Kharazi, 2001). This study also revealed that there is a meaningful relationship between the noise level, age and hearing loss ($p<0.001$).

The purpose of this research is to determine and study the impact of individual factors, attitudinal factors and noise level on noise annoyance among white-collar citizens of Tehran. Moreover, due to the fact that noise related annoyance includes the concept of undesired impact of sound on feelings and emotions, the relationship between individuals' personal traits and noise annoyance has been studied.

MATERIALS AND METHODS

In order to study the effect of personal and attitudinal factors, noise level, hearing status and personal traits on noise annoyance due to traffic noise in white-collar employees in Tehran, this study was conducted on 495 administrative staff and private sector employees such as shopkeepers and service sector employees who were exposed to noise. The participants were selected from five areas of Tehran. 91 were selected from north of Tehran, 105 from the south, 115 from the west, 83 from the east and 99 from central Tehran, so that relative homogeneity would be met in terms of ambient noise, education and level of income. Annoyance due to noise was determined using questions marked numerically from 1 to 11, and a five-alternative verbal question (from no annoyance to high levels annoyance). A general questionnaire (19 items) was also utilized to determine personal information, ownership of workplace and attitudinal factors including fearfulness (by records of illnesses or injury to ears), preventability, the necessity of controlling the volume, and people's evaluation of their workplace were all utilized.

Noise sensitivity as an attitude factor was measured by Weinstein noise sensitivity scale (WNSS) (21 items). In this survey hearing condition was considered as indicator of

fearfulness. Job satisfaction (19 items), Zung scale for anxiety (SAS) (20 items) (1971), Eysenc's Personality Inventory (EPI) (57 items), Buss and Perry's aggression (AQ) (29 items) (1992), and Beck's depression inventory (BDI) (13 items) (1961) questionnaires were filled in by participants. Weinstein's Noise Sensitivity and job satisfaction questionnaires were evaluated in terms of validity and reliability prior to use and were standardized.

Before the commencement of the research, interviewers, occupational health and psychology BS holders participated in a training course at Faculty of Public Health, Tehran University of Medical Sciences in order to get familiar with the purpose of the study, instruments of data collection, and the method of filling in the questionnaires (Eight interviewers participated in this research).

In general, it was intended to have all questions of questionnaires replied by the participants in the first approach, so that the rate of response accuracy would be increased, and the rate of questionnaires withhold would be decreased. Should a participant refrained from filling in the questionnaire in the first approach, it was attempted to have them fill it in and return it the same day or the day after.

The workplace noise of the participants was directly recorded by ½ inch (12.5 mm) polarized condenser (Bruel and Kjaer, 4188) and B&K2236 noise level meter. Noise meter was calibrated with a B and K 4231 acoustic calibrator at workplace at reference pressure level of 94dB at 1 kHz. Noise was measured at A – frequency weighting and fast time weighting, and daily noise exposure level (LEPd) was measured from average noise equivalent (Leq) , using $LEPd = Leq + 10 \log(T/8)$ equation. The microphone was placed at $0.91 \pm 0.05(m)$ and $1.55 \pm 0.075(m)$ in seating and standing positions, respectively, and the period of each recording was set at 20 to 60 minutes. Noise measurements were mostly performed between 8:00 to 12:00 am. It is worth mentioning that any unconventional event such as opening and closing of the doors and windows, and turning on or off of noise producing sources were prevented.

Another matter of concern was that participants

were chosen in a way that the major source of noise at their workplace was that of traffic. In places where noise produced by airplanes, construction work, and other noise pollutants were present, noise measurement was not performed and questionnaires were not distributed. During noise measurement period, employees were asked to perform their daily activities so that a more accurate measurement of noise could be conducted.

RESULTS

Individual factors

The mean estimate for age of the participants, hours of work per day, and length of residency were 30.91 years (S.D.=11.06), 10.75 hours (S.D.=2.44), and 4.43 years (S.D.=5.86), respectively. Table 1 represents some other characteristics of the participants. Correlation coefficient of noise annoyance questions with numerical and verbal alternatives showed

Table 1: Personal characteristics of participants

Sex	Male	87.4%
	Female	12.6%
Marital status	Married	52.3%
	Single	47.7%
Education	Secondary school graduate or lower	80.2%
	Post secondary	19.8%
Occupation	Self employed	71.4%
	Non-self employed	28.6%

that there is a high correlation between them (agreement = 90.13%).

The results revealed that 46.5% of participants were highly annoyed, 40.3% were moderately annoyed, and only 13.2% were lightly annoyed. The results of statistical analysis to measure the relationship between annoyance and individual factors are shown in Table 2.

The study revealed that the magnitude of noise annoyance in 30-49 age group is more in comparison with people under 30 or above 49

years of age ($p=0.0002$).

The annoyance level in 45.05% of non-owners was high, while this amount was 57.14% among owners. In other words, the level of annoyance exceeded in the case of owners compared to non-owners ($p=0.038$). On the other hand, the amount of annoyance was higher among married participants than among single ones ($p=0.001$). The study also showed that the amount of annoyance in participants with residency period (work experience) of above 4 years was 2.4 times that of those with less than 2 years of work experience ($p=0.001$).

Ordered Regression Test showed that among individual factors, ownership ($p=0.002$) and being married ($p=0.034$) had the highest relationships with noise annoyance.

Attitudinal factors

The attitudinal factors regarded in the study included sensitivity to noise, opinion of participants on preventability of noise, opinion of participants regarding the necessity of controlling the noise, fearfulness (as hearing conditions) and evaluation of participants of the amount of noise at workplace.

Frequency distribution of noise sensitivity revealed that 29.39% of participants had low sensitivity, 67.36% had moderate sensitivity, and 3.25% had high sensitivity. Not only noise annoyance had meaningful relationship with sensitivity to noise ($p=0.0015$), but it was also found out that noise annoyance in people with high level of noise sensitivity is more than in those with moderate (OR = 11.78) and low sensitivity (OR=4.88).

No meaningful relationship was found between noise annoyance and participants' opinion on noise preventability ($p=0.73$). Studying participants' opinion over the necessity of noise control and noise annoyance ($p=0.0003$) showed that the magnitude of noise annoyance in those who are not concerned about noise control is more than in those who believe noise should be controlled (OR=0.69).

The noise annoyance level among participants whose amount of their workplace noise had been evaluated as high was higher in comparison with those whose amount of their workplace noise had been evaluated as medium and low ($p=0.0001$). The present study revealed that the magnitude of noise annoyance among people who have reported their workplace as high in ambient noise is 4.05 times more than that among other people. As mentioned above, hearing conditions as an indication of fearfulness from noise was studied separately.

Table 2: Relation between annoyance and Individual Factors

Individual factors	X ²	p- Value
Age	10.33	0.03*
Sex	1.89	0.39
Ownership status	2.07	0.04*
Marital status	11.07	0.004**
Length of residence	22.94	0.001**
Education	0.32	0.85
Occupation	0.73	0.69
Daily working hours	1.46	0.14

*significant at 0.05 level.
**significant at 0.01 level.

Noise level

The amount of workplace ambient noise is presented in Table 3.

The present study did not reveal any meaningful relationship between the noise level in terms of $L_{EP,d}$ ($p=0.879$), L_{90} ($p=0.837$), L_{10} ($p=0.909$) and noise annoyance.

Table 3: Statistical characteristics of workplace ambient noise various indexes

Statistics	Noise Index		
	LEP d	L10(dBA)	L90(dBA)
Mean	65.05	71.11	60.68
S. D.	4.11	4.22	4.47
Minimum	55.10	59	50
Maximum	76.6	82	71

Hearing conditions

Hearing conditions of participants were studied based on self-reported general questionnaire by self-reported hearing status question. The results revealed that 10.89% of these participants stated that they had experienced hearing trauma and were still suffering from that. Another 62.67% stated that they had experienced hearing problem in the past but were healthy at the time of survey. Among the same study group, 26.44% maintained they had never experienced any hearing injury. Statistical analysis revealed a meaningful relationship between the magnitude of hearing injury of these three groups and noise annoyance (p=0.0023). The magnitude of annoyance in those who are currently suffering from hearing injury is 2.15 times that of those who experienced hearing injury in the past but have reported to be healthy now. Similarly, the amount of annoyance in individuals who have never experienced an injury is more than in those who are currently healthy but had injury in the past (OR=1.82).

Personality traits

Table 4 represents the personality traits of the participants. Table 5 represents the relationship between the participants' personality traits and noise annoyance.

Table 4: Participants' personality traits

Personality traits	Number	Percentage
Aggression	Non-aggressive	9 1.8
	Little	65 13.3
	Medium	328 67.1
	Rather high	76 15.5
	High	11 2.2
Depression	Non	186 38.0
	Little	110 22.4
	Medium	123 25.1
	High	71 14.5
Stability	Stable	190 41.1
	Unstable	272 58.9
Introversion/ Extroversion	Introvert	192 36.7
	Extrovert	279 63.3
Anxiety	Normal	280 57.0
	Low	177 36.0
	Medium	31 6.3
	High	3 0.6
Job satisfaction	Low	61 13.8
	Medium	313 70.8
	High	68 15.4

As can be seen in Table 5, there is no meaningful relationship between noise annoyance and personality traits, except anxiety. An in-depth study revealed that the magnitude of noise annoyance in individuals with medium level of anxiety is more than in those with either low or high level of anxiety (p=0.005).

Table 5: Relation between between participants' personality traits and noise annoyance

Variable	X ²	P-value
Aggression	6.92	0.545
Depression	9.28	0.148
Stability	0.22	0.879
Introversion/Extroversion	0.036	0.928
Anxiety	9.67	0.010**
Job satisfaction	5.83	0.067

** significant at 0.01

Major factors affecting the amount of noise annoyance

Statistical analyses revealed that from among individual factors, noise level, attitudinal factors, personality traits and hearing conditions, attitudinal factors including individual's self assessment of the amount of work-place noise (p=0.0001) and the opinion regarding the necessity of noise control (p=0.008) had the highest correlation to the magnitude of noise annoyance.

DISCUSSION

The results of the study clarified that 46.5% suffer from high levels of noise annoyance and 40.3% from low levels of noise annoyance. Regarding the fact that no comprehensive study on the prevalence of noise annoyance has been conducted in Iran, an accurate assessment of the level of the prevalence of this phenomenon in the society is not plausible. However, comparing the

outcomes of this study with studies conducted in other countries, it can be concluded that the prevalence of noise annoyance among white-collar employees is higher than that in other societies. For example, one study showed that 27% of the population of residential areas suffers from high levels of noise annoyance, and 35% suffer from low levels (Onuu, 2000). Longer daily periods of exposure, exposure to higher levels of noise, and the prevalence of workplace-related stressors could explain the reason. Air pollution, especially carbon monoxide, are probably the intervening factors in this study affecting the prevalence of noise annoyance.

The study also revealed that 62% of people are relatively depressed. Comparing these results with a study of health and sickness in Iran (Ministry of Health, 1990) revealed that the incidence of depression among white-collar employees in Tehran is much higher than that in Tehran province as well as in urban and rural regions of Iran. Table 6 compares the incidence of depression and anxiety in Tehran province and the rest of the population of the country. As can be seen in Table 6, the occurrence of anxiety among Tehran's population and among the country's urban and rural population is much lower than its occurrence among white-collar employees population. The high occurrence of depression and anxiety among employees could be due to work-related stress.

Table 6: Comparing depression and anxiety rates among the study's target

p- value	Incidence in Tehran's population		Incidence in the country's population*		Incidence in population under study	
	Rural	Urban	Rural	Urban		
<0.000	17%	18.5%	20.60%	21.20%	62%	Depression
<0.000	20.6%	23.30%	19.5%	21.50%	43%	Anxiety

*Ministry of Health, 1990

Individual factors

Many demographic variables such as sex, marital status, education, social status, and income have been studied in many researches. While studies do occasionally report effects of one variable or another, none of the variables have consistently been found to be associated with noise annoyance (Nelson, 1987).

The present study reveals that the higher the age, the higher the level of noise annoyance ($p=0.03$). These findings of this study match with the findings of two other studies conducted by Abo-Qudais (2005) and Koushki *et al.* (1993).

On the other hand, high levels of annoyance in individuals between 30 and 49 years of age, in comparison with those younger than 30 or older than 49, could be due to personality traits rooting in higher work and family responsibilities. Some researchers believe that the magnitude of noise annoyance does not depend on the individual's age (Kjellberg, *et al.*, 1996; Ouis, 2001). In fact, as age increases, hearing conditions aggravate and sensitivity to noise increases.

The positive relation between length of residence and noise annoyance ($p=0.001$) seems to be

contrary to the concept of adaptation of people to noise. In long term residency, it could be the case that noise adaptation would be influenced by changes in attitudinal factors.

The absence of relationship with ownership status and road traffic noise has been well documented. It could be theorized that ownership creates a commitment to the property such that owners cannot allow themselves to evaluate objectively disadvantages of their property, but the correlation between annoyance and ownership status in this study, could as well hypothesized that owners would be more likely to be concerned because they have more of a long-term interest in their property (Nelson, 1987).

Logistic regression test showed that from among individual factors which had a meaningful relationship with noise annoyance (age, ownership status, marital status and length of residency) (Table 2), only marital status and ownership status had a relationship with noise annoyance. In other words, the two variables of age and work experience are in turn influenced by being married and ownership normally corresponds with aging and work experience. On the other hand, work experience is a dependant of age. For this reason, probably individual parameters of marital status and ownership are effective on noise annoyance. A comparison between these findings with those of Abo-Qudias *et al.* (2005) could be interesting. This study which was conducted in Jordan revealed that owners face more annoyance in comparison with non-owners, and that singles suffer more injury than married individuals. It was also reported that women also suffered more than men ($p=0.001$), which does not comply with the results of this study ($p=0.39$). However, according to studies conducted by Enmarker *et al.* (2004) and Jones and Davis (1984) there is no difference between the level of noise annoyance among men and women.

Attitudinal factors

Noise annoyance is subject to six most consistently reported attitudes of fearfulness, noise preventability, noise sensitivity, perceived neighborhood quality, health effects and non-noise impacts of the source (such as air pollution), (Nelson, 1987). One of the limitations of the

present study is that not all the above mentioned attitudinal factors were included in the study. This study revealed that as noise sensitivity increases, so does the level of noise annoyance ($p=0.0001$). If noise sensitivity is considered as a fixed personal trait which comprises all the mentioned attitudinal factors, the results of this study complies with those of Stanfield (1992), Job (1988) and Zimmer (1999).

Statistical analyses did not show any meaningful relationship between noise annoyance and individuals' opinion on the preventability of noise, but once the necessity of noise control was stressed, this correlation was revealed. This finding indicates, to some extent, that the magnitude of annoyance is dependant on the unpleasant feeling it causes in individuals, rather than their awareness of the necessity of noise controllability.

The magnitude of noise annoyance showed a meaningful relationship with the individuals' rating of their workplace ambient noise ($p=0.0001$). Individuals' rating could be influenced by the district's quietness or crowdedness from the people's point of view, individuals' cultural backgrounds, and their sensitivity to noise.

Noise level

Some reports have demonstrated that noisiest event and heavy vehicles are important for the extent of annoyance caused by road traffic noise (Rylander *et al.*, 1986). The statistical level of L10 determines the level which is exceeded for a 10 percent of the total time. However, one can expect the L10 should be correlated with noise annoyance extent; but no meaningful relationship was seen between noise annoyance and various noise indexes such as L90, LEPd and L10. It can be inferred from this finding that noise annoyance is highly influenced by non-acoustical factors. Such finding seems very likely to occur. Reviewing the studies conducted on the level of noise and the magnitude of annoyance thus far, Job (1988) concluded that just less than 20% of the noise annoyance perceived by the people could be defined through exposure to noise, and noise sensitivity is the most important factor in noise annoyance (Zimmer and Ellermier, 1999). Berglund *et al.* (1975) showed that the magnitude

of annoyance is correlated with level of loudness of the sound and noisiness, rather than being correlated with objective indices of noise such as $Leq(A)$ (Vastfjall, 2002). Little correlation between noise and the level of annoyance may be due to errors of noise or annoyance measurement, the characteristics of the noise incidence, and personality differences (Sailer and Hassenzahl, 2000).

Hearing conditions

In the course of conducting the present research and filling out questionnaires, a negative approach toward traffic related noise was evident among individuals suffering from a hearing injury. As a result, the level of annoyance in this group was higher in comparison with those who had not experienced a hearing injury, and those having a hearing injury but were recovered. On the other hand, due to their fear of facing hearing injury, the magnitude of annoyance among healthy people is higher than that among those who had experienced injury but have recovered. Probably, those who had experienced injury but have recovered have no fear of noise pollution. In other words, the probability of experiencing hearing trauma has a positive effect on individuals' attitude.

A study of noise annoyance among school teachers and students conducted by Enmarker *et al.* (2004) has revealed that teachers were suffering more from noise annoyance, hearing loss and noise sensitivity (as an attitudinal factor). Similar to a study by Enmarker (2004), the present study showed that the magnitude of annoyance in people suffering from hearing injury is more than in those who are healthy. On the other hand, Kjellberg *et al.*, (1996) asserted that self reported hearing conditions and noise sensitivity are the most important variables in noise annoyance issue.

Psychological traits

Among psychological traits included in this study, only anxiety showed a meaningful relationship with noise annoyance ($p=0.01$), and job satisfaction was also correlated but at a lower level ($p=0.067$). According to the results of the study, 70% of people suffered from an average level of anxiety suffer from severe annoyance,

while this amount is 43.3% in case of normal people. Logistic regression test revealed that the magnitude of noise annoyance in individuals with medium anxiety has a significant difference with that in people with low level of anxiety ($p=0.005$, $OR=3.23$). It is worthwhile noticing that there was no significant difference between people with high anxiety and people with low level of anxiety ($p=0.393$). It seems as if people with medium level of anxiety concentrate on the workplace ambient noise and complains about it, while people with high anxiety take no account of this. A study conducted by Ohrstrom *et al.* (1988) revealed that there is a high correlation between noise annoyance and introversion/extroversion and personality stability, which is in contrast with the findings of the present study.

Studying the correlation between noise annoyance and job satisfaction revealed the presence of a positive and large correlation between the two in a way that individuals with high level of job satisfaction are suffering from noise annoyance 2.09 times more than those with low job satisfaction level. Increase in job satisfaction level could be related to social status, interest in occupation, status of organization. It seems that people with high level of job satisfaction expect that their workplace to be ideal from ambient noise level perspective.

Factors most effective in noise annoyance

Considering the results of the present study, factors effective in noise annoyance could be represented as Fig.1. The figure shows that personality traits are effective in noise annoyance. It is worth mentioning that according to causative model, social reactions, modifiers, and health consequences, noise annoyance could in turn affect individuals' personality traits (Job, 1998). In their invaluable article, Guski *et al.*, (1999) maintained that the concept of noise annoyance is correlated with agitation, seriousness, dissatisfaction, worry, bother, discontent, irritation, anger, stress, frustration, and hatred. All these factors are directly influenced by the mental and psychological reactions of the individual. In other words, noise annoyance level rated by individuals cannot be independent from their psychological states and characteristics. In an

early study on the relationship between noise and annoyance, Laird and Coye (1929) maintained that humans cannot accept stimulants as they really are, but humans, based on their previous experiences, recognize a stimulant as desirable or undesirable.

The assumption that factors effective in noise annoyance would be inter-correlated is not unlikely. Logistic regression test was conducted in order to determine the most significant factors effective in noise annoyance, and it was found out that from among all factors only attitudinal factors were correlated with noise annoyance. The most important attitudinal factors were individuals' self evaluation of workplace ambient noise and people's opinion about the necessity of noise control. While there are various definitions for attitude, most psychologists see it as a stable recognition system dealing with a specific subject. The individual, therefore, judges a subject as

good, bad, or anything in the Likert scale. Even when enough personal information about a subject is not available, most people have the same attitude towards that issue. Such attitude is sometimes rooted in socio-cultural traditions and sometimes is an impulse stimulated by the title of the issue (Guski *et al.*, 1999). Kryter (1994) states that the individual's judgment on whether a sound is irritating is affected by the person's personal information of that sound and their attitude towards it, which is in turn due to the disturbance it creates in the person's activities. Furthermore, the study conducted by Sorensen and Jonson (1970) reveals that judgment on the irritability of noise is due to the attitude towards that sound. The findings of this study emphasize the point that noise annoyance is generally due to attitude.

The present study reveals that people's attitude towards noise and the noise pollution predicament has a great influence on noise annoyance.

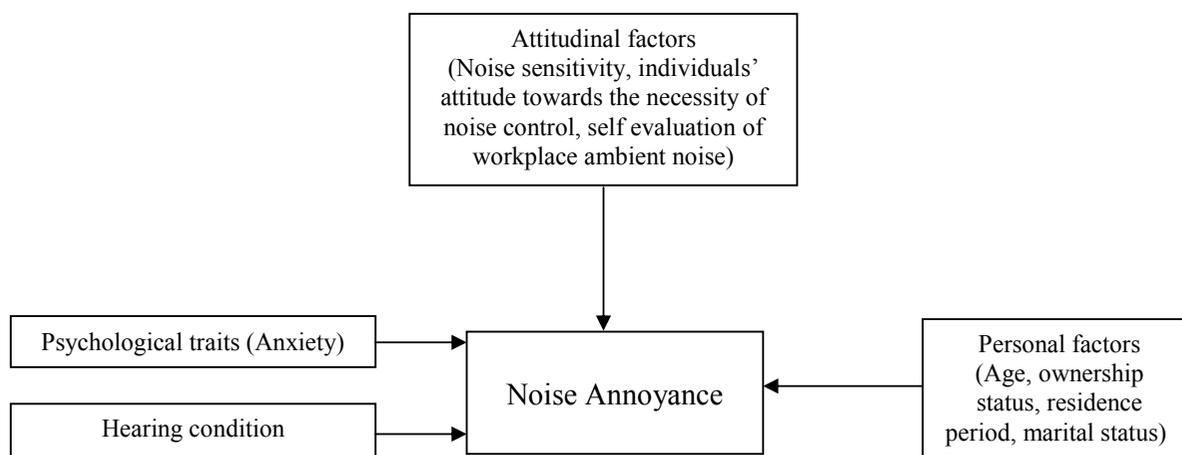


Fig. 1: Effective factors in noise annoyance

However, due to the difficulties in collecting evidence regarding causal correlation between these groups of variables and noise annoyance, and the fact that these variables are inter-related, further studies are advised. There is also this possibility that the findings of this study were influenced by transient psychological moods and states. Therefore, designing and conducting studies in which psychological moods and states are under control could reveal more accurate

findings.

ACKNOWLEDGEMENTS

The efforts of Marzieh Kazempoor and Parisa Bahrami are hereby appreciated. The authors are also thankful to Mr. Sahlani and Mr. Mahmoudi for their effective efforts and cooperation in sound measuring and helping with applications

filled out.

REFERENCES

- Ministry of Health, Treatment and Education, Research Department, National Medical Science Research Centre of Iran (1990). A Study on Health and Illness in Iran.
- Abo-Qudais, S., Abu-Qdais, H., (2005). Perceptions and Attitudes of Individuals Exposed to Traffic Noise in Working Places. *Building and Environment*, **40**(6):778-787.
- Beck, A.T., Ward, C., Mendelson, M., (1961). Beck Depression Inventory (BDI). *Arch Gen Psychiatry*, **4**: 561-571.
- Buss, A.H., Perry, M.,(1992). The Aggression Questionnaire, *J. Pers. Soc Psychol*, **63**: 452-459.
- Belojevic, G., Jakovljevic, B., Aleksic, O.,(1997). Subjective Reaction to Traffic Noise With Regard to Some Personality Traits. *Environment International*, **23**(2): 221-226.
- Berglund, B., Berglund, U., Lindvall, T., (1975). Scaling Loudness, Noisiness, and Annoyance of Aircraft Noise. *J Acoust Soc Am*, **57**: 930-934.
- Broadbent, D.E.,(1972). Individual differences in annoyance by noise. *Sound*, **6**:56-61.
- Enmarker, I., Boman, E.,(2004). Noise Annoyance Responses of Middle School Pupils and Teachers. *J. Environ Psychol*, **24**: 527-536.
- Guski, R., Felscher-suhr, U., Schuemer, R., (1999). The Concept of Noise Annoyance: How International Experts See It. *J.Sound Vib*, **223**(4): 513-527.
- Job,R.F.S., (1988). Community Response To Noise : A Review Of factors Influencing The Relationship Between Noise Exposure And Reaction. *J. Acoust Soc Am*, **83**(3): 991-1001.
- Job,R.F.S., (1996). The Influence of Subjective Reaction to Noise on Health Effects of the Noise, *Environment International*, **22**(1): 93-104.
- Jones, D.M., Davies, D.R., (1984). Individual and Groups Differences in the Response to Noise. In E.M. Jones, & A.J. Chapman (Eds), *Noise and Society*, Chichester, Wiley. 125-153.
- Jonson, E., Sorensen, S., (1970). Relation between Annoyance Reactions and Attitude to the Source of Annoyance. *Public Health reports*, **85**:1070-1074.
- Kharazi, P., (2001). The Impact of Noise Pollution on Job-Related Exhaustion of an Oil Refinery in Tehran and Managerial Solutions to Reduce This Impact, M.A thesis, Environmental Studies, Islamic Azad University.
- Kjellberg, A., Landstrom, U., Tesarz, M., Soderberg, L., Akerlund, E., (1996). The Effects of Nonphysical Noise Characteristics, Ongoing Task and Noise Sensitivity on Annoyance and Distraction Due to Noise at Work. *J. Environ Psychol*, **16**: 123-136.
- Koushki, P.A., Cohn, L.F., Felimban, A.A., (1993). Urban Traffic Noise in RIYADH, SAUDIARRABIA: Perceptions and attitudes. *J. Transp.Eng*, **119**: 751-62.
- Kryter, K.D., (1994). *The Handbook of Hearing and the Effects of Noise*. Academic Press, San Diego.
- Laird, D.A., Coye, K., (1929). Psychological Measurements of Annoyance as Related to Pitch and Loudness. *J. Acoust Soc Am*, **1**:158-163.
- Lindvall,T., Radford, E.P., (1973). Measurement of Annoyance Due to Exposure to Environmental Factors. *Environmental Research*, **6**:1-36.
- Nelson, P.M., (1987). *Transportation Noise Reference Book*. Butterworth, London.
- Ohrstrom, E., Bjorkman, M., Rylander, R.,(1988). Noise Annoyance with Regard to Neurophysical Sensitivity, Subjective Noise Sensitivity and Personality Variables. *Psychological Medicine*, **18**:605-613.
- Onnu, M.U., (2000). Road Traffic Noise in NIGERIA: Measurement, Analysis and Evaluation of Nuisance. *J Sound. Vib*, **233**(3): 391-405.
- Ouis, D., (2001). Annoyance from Road Traffic Noise: A Review. *J. Environ Psychol*, **21**:101-120.
- Raw, G. J., Griffiths, I. D., (1988). Individual Differences in Response to Road Traffic Noise. *J.Sound Vib*, **121**(3): 463-471.
- Rylander, R., Bjorkman, M., Ahrlin, U., Artzen, E., Solberg, S., (1986). Dose-response Relationships for Traffic Noise and Annoyance. *Archives of Environmental Health*, **41**(1): 7-10.
- Sailer, U., Hassenzahl, M.,(2000). Assessing Noise Annoyance: An Improvement Oriented Approach. *Ergonomics*, **43**:1920-1938.
- Shalchian, A., (1995). Traffic-Related Noise Pollution Level in Azadi and Enghelab Ave from Azadi Square to Imam Hossein Square and its Impact on People, M.A.Thesis, Environmental Studies, Islamic Azad University.
- Stansfeld, S.A., (1992). Noise, Noise Sensitivity and Psychiatric Disorder: Epidemiological and Psychophysical Studies. *Psychological Medicine, Monograph Supplement*, pp.22.
- Vastfjall, D., (2002). Influence of Current Mood and Noise Sensitivity on Judgments of Noise Annoyance. *J.Psychol*, **4**: 357-370.
- Williams, I.D., Mc Crea, I.S., (1995). Road Traffic Nuisance in Residential and Commercial Areas. *The Science of the Total Environment*, **69**: 75-82.
- Yano, T., (2002). Community Response to Environmental Noises and the Construction of Standardized Noise Annoyance Scales. *Recent Res.Devel. Sound & Vibration*. 1: 1-27. ISBN: 81-7895-031-6.
- Zimmer, K., Ellermeier, W., (1999). Psychometric Properties of Four Measures of Noise Sensitivity: A Comparison. *J. Environ. Psychol*, **19**: 295-302.
- Zung, W.W., (1971). A rating instrument for anxiety disorders, *Psychosomatics* **12** (6): 371-379.