

## Assessment of noise induced psychological stresses on printery workers

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**ABSTRACT:** The purpose of this study was to assess the relationship between psychological stresses and noise stresses on printery workers in Tehran, Iran. Hence, 267 workers were randomly selected. The  $L_{eq}$  and  $L_{max}$  were measured and the psychological stresses such as depression, anxiety, aggression and job satisfaction were also studied by the relevant questionnaires. The data were statistically analyzed by Pearson correlation test. The results demonstrated that there was no significant statistical relationship between noise and psychological stresses. In addition, by using Spearman regression method, the influence of variables such as age, gender and job history on psychological stresses caused by  $L_{eq}$  and  $L_{max}$  was studied and the results only revealed that the aggression caused by  $L_{eq}$  increased in young personnel ( $P=0.02$ ) as well as, anxiety caused by  $L_{max}$  increased accompanied by increasing the job history and age of the workers ( $P=0.002$  and  $P=0.007$ ). Therefore, more variables must be taken into consideration to judge about noise induced psychological stresses in workplaces.

**Key words:** Aggression; Anxiety; Depression; Job satisfaction; Printery

### INTRODUCTION

Excessive noise can cause psychological disorders such as anger, anxiety, irritability, and general emotional stress. Noise may have negative effect on workers performance due to reduced worker morale and motivation. Mental fatigue may cause distraction and poor judgment (EPA, 1973). Moreover, noise can cause such anti-social behavior as aggression and violence, for instance notice a business executive who was shot nearby water-skiers or a night clerical worker who killed a child outside his apartment (EPA, 1973). In addition, laboratory studies have demonstrated that excessive noise may decrease social interaction, social responsibility, and verbal disinhibition, diminish helping behavior, and increase aggressive disorders (Geen and Powers, 1971; Sherrod and Downs, 1974; Matthews and Cannon, 1975; Juang *et al.*, 2010).

Mokhtar *et al.* (2007) reported no psychological disorders due to noise among workers of different industries such as: rubber product manufacturing, metal stamping, publication and printing. Studies have demonstrated that the incidence of mental illness is higher among people in residential areas exposed to high noise levels however, the evidence is inconclusive (Banerjee *et al.*, 2009; Mohammadi Roozbahani, 2009; Omidvari and Nouri, 2009; Mishra *et al.*, 2010). It is reported that the prevalence of mental problems was higher in the population nearest the London's Heathrow Airport (Abey-Wickrama *et al.*, 1969). Conversely, no significant relationship between minor psychiatric illness and noise exposure among residents near three Swiss airports was reported (EPA, 1981). Nevertheless, noise is not believed to have direct role with regard to mental illness but it might accelerate the development of latent mental responses (Stansfeld *et*

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al, 1985; Nounou and Nounou, 2010). Therefore, the purpose of this study which was carried out in 2009 was to assess the relationship between psychological stresses and noise among printery workers in Tehran, Iran.

## MATERIALS AND METHODS

Using correlation test the relationship between occupational noise level, job satisfaction and psychological stresses was evaluated.

### Case group

Of the 330 personnel who work 8 hours daily and 40 hours weekly, 267 workers were participated in the study. The average age of them was  $33.13 \pm 7.62$ . In addition, only 3.7 % of the personnel had diploma degree or upper than that and also 18.5 % of the personnel were single and 81.5 % of them were married. Meanwhile, 7.7 % of the workers consumed sleeping pills.

### Population questionnaire

This questionnaire is related to the determination of personal characteristics (age, gender, job, educational degree, marriage condition, job history, part and instrument), level of annoyance due to background noise level in the workplace and at home (having disorder or harm to the ear over the past year, when noise cause more annoyance), theoretical factors of the noise (feasibility of noise control, necessity of noise control, site evaluation), changing the job position, working in the noisy environment to obtain more wage, workplace noise pollution, sport, smoking, consuming sleeping pills and duration of daily work.

### Job satisfaction questionnaire

This questionnaire was introduced by Brayfield and Rothe, (1951) which have been frequently used by researchers. This questionnaire has 5 parts: satisfaction from institute, job satisfaction, satisfaction among workgroup, satisfaction from supervision and satisfaction from salary. Hence, in this study in order to determine job satisfaction of the personnel, this questionnaire which has 19 questions was used. Each question has 5 choices from “strongly disagree” to “strongly agree”. Higher score in this test indicates higher job satisfaction. Then total score of the test was investigated. The validity of the test according to Brayfield and Rothe report is credible and 77 referees

have verified the fact that each question makes job satisfaction. Chaudhury and Banerjee, (2004) assessed the job satisfaction of medical officers of the Armed Forces by using Brayfield and Rothe Job satisfaction and their overall results revealed that there was a low level of job satisfaction among the medical officers Gautam et al. (2006) studied the job satisfaction of faculty members of veterinary sciences using the scale developed by Brayfield and Rothe and their results indicated that the overall job satisfaction of the faculty members is moderate

### Aggression questionnaire (AQ)

Aggression questionnaire was introduced by Buss and Perry, (1992). This questionnaire evaluates four aspects of aggression: physical aggression (questions 1, 5, 9, 13, 17, 21, 24, 26 and 28), verbal aggression (questions 2, 6, 10, 14 and 18), anger (questions 3, 7, 11, 15, 19, 22 and 29) and hostility (questions 4, 8, 12, 16, 20, 23, 25 and 27). The score of each aspect of that indicates different types of aggression. Hence, this questionnaire which has 29 questions was used and the total score of that was taken in to account to study total level of aggression which statistically analyzed. The higher score indicates the higher level of aggression. Harris (1995 and 1997) concluded that AQ published by Buss and Perry has good construct validity and predictability and has proved its worth in studying aggression profiles and predicting violent behavior (Bushman and Wells, 1998; Donnellan et al, 2005).

### Beck depression inventory questionnaire (BDI)

This test was introduced by Beck et al. (1961) to determine intensity of depression. During recent 35 years, this questionnaire has been accepted as the best method to recognize intensity of depression in patients who have received clinical diagnosis of depression (Piotrowski et al, 1985; Archer et al, 1991). The short form of depression questionnaire was introduced by Beck, (1972) that the correlation between the short form and the long form varied from 0.89 to 0.97 (Beck et al, 1974). Based on the 13-item short form, the reliability coefficients were obtained as well as the long form. Therefore, Beck's short form was used to evaluate the case group depression and the total scores were statistically analyzed. Until now many researchers in the world have proved the validity and reliability of this test.



May *et al.* (1969) have verified that this test of the diagnosis has validity and is able to predict too. In addition, Visser *et al.* (2006) evaluated the validity, reliability, and potential responsiveness of the Beck Depression Inventory (BDI) in patients with Parkinson’s disease (PD) and concluded that the BDI is a valid, reliable, and potential responsive instrument to assess the severity of depression in PD. Moreover, Beck *et al.*, (1988) based on a high level analysis resulting from different attempts in order to determine subjective parallelism, obtained coefficients ranged from 0.73 to 0.92 with the average of 0.86.

*Self rating anxiety scale questionnaire*

Zung, (1971) used this questionnaire to evaluate symptoms related to anxiety in psychological patients. This questionnaire is one of the common clinical tests regarding the measurement of anxiety intensity. The self-rating test has 20 questions and each question has four choices (never, sometimes, often and almost always) which is assigned a score ranging from 1 to 4 in addition, the lowest score shows the lowest level of anxiety. Ward *et al.* (2003) assessed the reliability of the Beck Depression Inventory and the Self-Rating Anxiety Scale in a sample of South African adolescents and they concluded that these instruments may be reliable in developing contexts. Lindsay and Michie, (1988) studied the Adaptation of the Zung self-rating anxiety scale for people with a mental handicap and their results demonstrated that

a simple response concerning presence or absence of the anxiety symptom was most reliable.

*Noise measurement*

To measure occupational noise level a Brüel & Kjær sound level meter model 2236-Coo2 was used. In the position of 91 cm height in the sitting manner and 151 cm height in the standing manner, Equivalent Sound Level ( $L_{eq}$ ) and Maximum Sound Level ( $L_{max}$ ) were measured according to ISO 9612, (1997). Meanwhile, occupational noise was measured before, during and at the end of the working shifts at the position of workers.

**RESULTS AND DISCUSSION**

Tables 1-4 show the results of the Job Satisfaction, anxiety, aggression and Beck questionnaires respectively. As shown in Table 1, of the 267 workers only 179 workers answered to the job satisfaction questionnaire. The majority (32.2 %) of the workers reported low job satisfaction.

Table 2 shows that the majority of the workers (45.3 %) felt no anxiety when working. Meanwhile, 63 workers did not answer to the anxiety questionnaire.

Based on Table 3 the majority of the workers (13.5 %) felt no aggression when working. Moreover, of the 216 workers only 51 workers answered to the aggression questionnaire.

According to Table 4, of the 267 workers only 212 workers answered to the Beck questionnaire. The majority of the workers (39.3 %) felt no depression when working. The mean equivalent sound pressure

Table 1: The results of the Job Satisfaction questionnaire

		Frequency	Percent	Valid (%)	Cumulative (%)
Valid	Without	56	21.0	31.3	31.3
	Low	86	32.2	48.0	79.3
	Moderately	37	13.9	20.7	100.0
	Total	179	67.0	100.0	-
Missing		88	33.0	-	-
Total		267	100.0	-	-

Table 2: The results of the anxiety questionnaire

		Frequency	Percent	Valid (%)	Cumulative (%)
Valid	Normal	121	45.3	59.3	59.3
	Low	67	25.1	32.8	92.2
	Moderately	12	4.5	5.9	98.0
	High	4	1.5	2.0	100.0
	Total	204	76.4	100.0	-
Missing		63	23.6	-	-
Total		267	100.0	-	-



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Table 3: The results of the aggression questionnaire

		Frequency	Percent	Valid (%)	Cumulative (%)
Valid	Normal	36	13.5	70.6	70.6
	Low	14	5.2	27.5	98.0
	Moderately	1	.4	2.0	100.0
	Total	51	19.1	100.0	-
Missing		216	80.9	-	-
Total		267	100.0	-	-

Table 4: The results of the Beck depression inventory questionnaire

		Frequency	Percent	Valid (%)	Cumulative (%)
Valid	Normal	105	39.3	49.5	49.5
	Low	42	15.7	19.8	69.3
	Moderately	37	13.9	17.5	86.8
	High	28	10.5	13.2	100.0
	Total	212	79.4	100.0	-
Missing		55	20.6	-	-
Total		267	100.0	-	-

Table 5: Relationship between  $L_{eq}$  and  $L_{max}$  with psychological stresses among workers

Psychological stresses	Mean	SD	Pearson Correlation Coefficient	P-value	N
Depression	6.43	7.15	R=0.013 ( $L_{eq}$ )	P=0.855 ( $L_{eq}$ )	212
			R=0.005 ( $L_{max}$ )	P=0.942 ( $L_{max}$ )	
Aggression	46.92	9.95	R=0.088 ( $L_{eq}$ )	P=0.541 ( $L_{eq}$ )	51
			R=0.061 ( $L_{max}$ )	P=0.67 ( $L_{max}$ )	
Anxiety	35.76	8	R=0.080 ( $L_{eq}$ )	P=0.261 ( $L_{eq}$ )	204
			R=0.074 ( $L_{max}$ )	P=0.297 ( $L_{max}$ )	
Job satisfaction	38.31	11.89	R=0.008 ( $L_{eq}$ )	P=0.912 ( $L_{eq}$ )	179
			R=0.020 ( $L_{max}$ )	P=0.792 ( $L_{max}$ )	

Table 6: Statistical relationships between personal variables and depression caused by occupational noise ( $L_{eq}$  and  $L_{max}$ )

Variables		Pearson correlation coefficient	P-value	N
Gender	Male	R=0.01 ( $L_{eq}$ )	P=0.886 ( $L_{eq}$ )	190
		R=0.004 ( $L_{max}$ )	P=0.975 ( $L_{max}$ )	
	Female	-	-	2
Age	20-30	R=0.337 ( $L_{eq}$ )	P=0.260 ( $L_{eq}$ )	75
		R=0.263 ( $L_{max}$ )	P=0.409 ( $L_{max}$ )	
	30-40	R=0.892 ( $L_{eq}$ )	P=0.108 ( $L_{eq}$ )	79
		R=0.196 ( $L_{max}$ )	P=0.804 ( $L_{max}$ )	
40<	R=0.234 ( $L_{eq}$ )	P=0.655 ( $L_{eq}$ )	35	
	R=0.203 ( $L_{max}$ )	P=0.699 ( $L_{max}$ )		
Job history	10<	R=0.433 ( $L_{eq}$ )	P=0.332 ( $L_{eq}$ )	102
		R=0.241 ( $L_{max}$ )	P=0.386 ( $L_{max}$ )	
	10-20	R=0.138 ( $L_{eq}$ )	P=0.767 ( $L_{eq}$ )	51
		R=0.109 ( $L_{max}$ )	P=0.816 ( $L_{max}$ )	
20<	R=0.884 ( $L_{eq}$ )	P=0.116 ( $L_{eq}$ )	15	
	R=0.888 ( $L_{max}$ )	P=0.112 ( $L_{max}$ )		



Table 7: Statistical relationships between personal variables and aggression caused by occupational noise ( $L_{eq}$  and  $L_{max}$ )

Variables		Pearson Correlation Coefficient	P-value	N
Gender	Male	R=0.144( $L_{eq}$ ) R=0.084( $L_{max}$ )	P=0.329( $L_{eq}$ ) P=0.569( $L_{max}$ )	190
	Female	-	-	2
Age	20-30	R=0.998( $L_{eq}$ ) R=0.898( $L_{max}$ )	P=0.02( $L_{eq}$ ) P=0.102( $L_{max}$ )	75
	30-40	R=0.522( $L_{eq}$ ) R=0.067( $L_{max}$ )	P=0.478( $L_{eq}$ ) P=0.985( $L_{max}$ )	79
	40<	R=0.995( $L_{max}$ )	P=0.062( $L_{max}$ )	35
Job history	10<	R=0.577( $L_{eq}$ ) R=0.577( $L_{max}$ )	P=0.422( $L_{eq}$ ) P=0.423( $L_{max}$ )	102
	10-20	R=0.970( $L_{eq}$ ) R=0.973( $L_{max}$ )	P=0.157( $L_{eq}$ ) P=0.148( $L_{max}$ )	51
	20<	-	-	15

Table 8: The influence of personal and job variables on anxiety caused by occupational noise ( $L_{eq}$  and  $L_{max}$ )

Variables		Pearson Correlation Coefficient	P-value	N
Gender	Male	R=0.040( $L_{eq}$ ) R=0.038( $L_{max}$ )	P=0.956( $L_{eq}$ ) P=0.599( $L_{max}$ )	190
	Female	-	-	2
Age	20-30	R=0.334( $L_{eq}$ ) R=0.338( $L_{max}$ )	P=0.316( $L_{eq}$ ) P=0.481( $L_{max}$ )	75
	30-40	R=0.387( $L_{eq}$ ) R=0.486( $L_{max}$ )	P=0.344( $L_{eq}$ ) P=0.222( $L_{max}$ )	79
	40<	R=0.995( $L_{eq}$ ) R=0.993( $L_{max}$ )	P=0.05( $L_{eq}$ ) P=0.007( $L_{max}$ )	35
Job history	10<	R=0.391( $L_{eq}$ ) R=0.414( $L_{max}$ )	P=0.166( $L_{eq}$ ) P=0.141( $L_{max}$ )	102
	10-20	R=0.973( $L_{eq}$ ) R=0.996( $L_{max}$ )	P=0.147( $L_{eq}$ ) P=0.057( $L_{max}$ )	51
	20<	R=0.562( $L_{eq}$ ) R=0.998( $L_{max}$ )	P=0.325( $L_{eq}$ ) P=0.002( $L_{max}$ )	15

level ( $L_{eqA}$ ) and maximum sound pressure level ( $L_{max}$ ) were  $81.2 \pm 9.6$  dBA and  $102.3 \pm 9.2$  dBA, respectively. In this study in order to investigate the relationship between psychological stresses and background noise level in workplace,  $L_{eq}$  and  $L_{max}$  with the total scores of the psychological questionnaire were taken into consideration to calculate the Pearson correlation test (Table 5). According to Table 5 there is no significant statistical relationship between  $L_{eq}$  and  $L_{max}$  with psychological stresses among the personnel. According to Table 6, the influence of variables such as age, gender and job

history on depression caused by  $L_{eq}$  and  $L_{max}$  was studied and the results revealed no significant statistical relationship between the personal variables and depression caused by  $L_{eq}$  and  $L_{max}$  among workers. According to Table 7 there is a statistical relationship between age and aggression caused by  $L_{eq}$  among workers who were between 20-30 years old ( $P=0.02$ ). But there is no significant statistical relationship between personal variables and aggression caused by  $L_{max}$  among workers. Moreover, according to Table 8 there are significant statistical relationships between job history and age with anxiety caused by  $L_{max}$  ( $P=0.002$



Table 9: Statistical relationships between the personal and job variables and job satisfaction caused by occupational noise ( $L_{eq}$  and  $L_{max}$ )

Variables		Pearson correlation coefficient	P-value	N
Gender	Male	R=0.031 ( $L_{eq}$ ) R=0.055 ( $L_{max}$ )	P=0.695 ( $L_{eq}$ ) P=0.483 ( $L_{max}$ )	190
	Female	-	-	2
Age	20-30	R=0.031 ( $L_{eq}$ ) R=0.016 ( $L_{max}$ )	P=0.938 ( $L_{eq}$ ) P=0.968 ( $L_{max}$ )	75
	30-40	R=0.127 ( $L_{eq}$ ) R=0.655 ( $L_{max}$ )	P=0.811 ( $L_{eq}$ ) P=0.158 ( $L_{max}$ )	79
	40<	R=0.338 ( $L_{eq}$ ) R=0.928 ( $L_{max}$ )	P=0.578 ( $L_{eq}$ ) P=0.248 ( $L_{max}$ )	35
	10<	R=0.088 ( $L_{eq}$ ) R=0.314 ( $L_{max}$ )	P=0.797 ( $L_{eq}$ ) P=0.347 ( $L_{max}$ )	102
Job history	10-20	R=0.870 ( $L_{eq}$ ) R=0.870 ( $L_{max}$ )	P=0.130 ( $L_{eq}$ ) P=0.130 ( $L_{max}$ )	51
	20<	R=0.815 ( $L_{eq}$ ) R=0.806 ( $L_{max}$ )	P=0.185 ( $L_{eq}$ ) P=0.194 ( $L_{max}$ )	15

and  $P=0.007$ ). On the other hand, anxiety cause by  $L_{max}$  increases accompanied by increasing the age and job history of the workers. But there is no significant statistical relationship between the personal and job variables with anxiety caused by  $L_{eq}$  among workers. Moreover, Table 9 shows no statistical relationship between the personal and job variables with job satisfaction caused by  $L_{eq}$  and  $L_{max}$  among workers. The results revealed no significant statistical relationship between psychological stresses and occupational noise level among workers of a printery in Tehran, Iran and this meets the findings obtained by the other researchers (EPA, 1973; Mokhtar et al, 2007). In addition, Leather et al, (2003) reported no direct effect of ambient noise levels on job satisfaction among 128 office workers. In contrast, some studies emphasize on the fact that psychological stresses can be affected by occupational noise level in workplace (Shaffer, 1983; Stansfeld, 1992). Moreover, Mahendra Prashanth and Sridhar, (2008) reported the relation between irritability and low and mid-octave band frequencies among industrial workers. Also, Chubarov et al, (1999) examined mental health among workers of a reinforced concrete plant and a thermal electric power station and they reported adverse effect of noise on workers function. Indeed, the findings of this study verify the fact that noise is not believed to be a direct cause of mental illness but might accelerate and

intensify the development of latent mental disorders (Stansfeld et al, 1985). Hence, beside background noise, the other personal and environmental factors with regard to psychological stresses must be taken into consideration (EPA, 1974; Shaffer, 1983 and Atkinson et al, 1999).

According to the findings of the present study it can be stated that age and job history can affect aggression and anxiety it means that aggression caused by  $L_{eq}$  increased in young personnel in addition, anxiety caused by  $L_{max}$  increased accompanied by increasing the age and job history of the workers based on statistical test.

Moreover, a lot of studies have analyzed depression with regard to personal and social factors such as gender, widowhood, low level of education (Miller et al, 1941). Nevertheless, studies have implied to the role and relation of personality type and personal differences of individuals exposed to noise (Shaffer, 1983) which was not taken into consideration in the present study therefore, considering personality psychology seems to be needed.

## CONCLUSION

The study was conducted to assess noise induced psychological stresses in 267 workers of a printery in Tehran, Iran. Hence,  $L_{eq}$  and  $L_{max}$  were measured and also psychological stresses such as depression, anxiety, aggression and job satisfaction were studied





by relevant questionnaires. The results indicated that there was no significant statistical relationship between noise and psychological stresses. Moreover, aggression caused by  $L_{eq}$  increased in young personnel and anxiety caused by  $L_{max}$  increased accompanied by increasing the job history and age of the workers.

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