

ORIGINAL ARTICLE

ASSESSMENT OF TRAFFIC NOISE AND THE ASSOCIATION WITH NON AUDITORY EFFECT AMONG SHOP LOT WORKERS IN KAJANG, SELANGOR

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ABSTRACT

The objective of study is to determine traffic noise level and non-auditory effect among shop lot workers at Kajang Selangor. This cross sectional study was carried to study traffic noise exposure with annoyance and work performance level among shop lot workers in Jalan Mendaling, Jalan Tukang and Jalan Sulaiman at Kajang town, Selangor. This study involves 120 shop lot workers that exposed to the traffic noise during their working hours where they are randomly selected. Noise exposure was estimated using the Sound Level Meter for environmental noise. The traffic volume was recorded using video recorder and calculated using tally counter. One set questionnaire consist standard questionnaire was used to assess the annoyance level and work performance level among the respondents. Respondents were predominantly by male which are 94 and female, 26 respondents. The mean age of the respondent were ranged between 41 to 60 years old. Only 12.5% of respondent are ranged 21 until 30 years old. In total of 120 respondent, 54.2% of them are Chinese while Malay and India only 30% and 15.8% respectively. The result showed that the traffic noise level at study areas are exceeded the permissible sound limit of commercial and business area during daylight which is 70 dB(A). Regarding work performance, 94 respondents are having low work performance level and 82% of respondent high annoyance level during the exposure of traffic noise from four different sources which are noise from the traffic, speeding vehicle, high traffic volume and exhaust system. There is a significant relationship between traffic noise level with work performance level ($p=0.001$) and annoyance level ($p=0.026$). The average traffic noise (Laeq) level at Jalan Mendaling, Jalan Tukang and Jalan Sulaiman is 71.19 dB(A) which were high and exceeds permissible sound level from road traffic, commercial and business place at day time, 70 dB(A). The exposure from the traffic noise effect the annoyance level and work performance level among the shop lot worker. In order to reduce traffic noise exposure towards the shop lot workers, some recommendation are needed to control the traffic noise such as build a noise barrier, plant trees and also enforcement of legal requirement in noise level.

Keywords: Environmental noise, traffic noise, average traffic noise (Laeq), annoyance, work performance

INTRODUCTION

Noise is classified as one type of pollution. Noise pollution may exist if the sound is unwanted to human. The definition of noise are describing as a 'sound which is undesired by the recipient'¹. Noise also defined as unwanted sound, consequently it can be considered as the wrong sound in the wrong place at the wrong time². It is displeasing or excessive sound that may disrupt and interrupt the activity or balance of human life.

Environmental noise pollution relates to ambient sound levels beyond the comfort levels as caused by traffic, construction, industrial, as well as some recreational activities. The effects of environmental noise pollution are multifarious to human health which is irritability, insomnia, annoyance, nuisance, muscular rigidity, perspiration, cerebral disorientation, low productivity, psychological changes in heart beat and blood pressure as well as psychological stress³. These health effects, in turn, can lead to social handicap, reduced productivity, decreased performance in learning, absenteeism in the workplace and school, increased drug uses, and accidents. Furthermore, stress and hypertension are commonly regarded as being among the leading causes of population health problems⁴. It

also can effects work efficiency and quality of life.

Thus, the study will focus on the road traffic in town Kajang, Selangor. In Malaysia, total out of 25 101 192 were recorded in 2014 and Selangor alone with 2 679 955 vehicle. Meanwhile in Kajang and Hulu Selangor were recorded 102 709 and 50 933 vehicles respectively⁵. Therefore, this study is very important in order to determine the noise effect of vehicle to the worker work performance.

With increasing number of vehicles in Malaysia, traffic noise represents the most pervasive source of community noise. Traffic noise is produced by vehicular flow on roads. Prolonged exposure from the noise may affect our health whether we realized it or not especially for the shop lot workers who exposed daily to it. This study was focused on the workers in the shop lot who works in town Kajang, Selangor. Exposure to the noise for long time can have an effect to human especially to non-auditory effect such as annoyance and work performance.

The objectives are to determine the traffic noise levels and non-auditory effect among shop lot workers in Kajang town, Selangor. Since the workers in the shop lot area is a high risk group of development to non-auditory effects, assessment

of environmental noise is an important tool to detect the tendency of noise pollution and its effects to the workers health. By identify the level of noise in this study, a relationship can be done between the noise pollution and its health impact to the workers in a shop lot area.

METHODS

This study was conduct at the shop lot in Kajang town. This study is focus on the shop lot workers who are exposed to the noise pollution. Analytical cross-sectional used to determine the relationship between risk factor and health consequences. The study population in this study are consists of shop lot workers or its owner at Jalan Mendaling, Jalan Tukang, and Jalan Sulaiman in Kajang town, Selangor.

The worker from the shop lot in study area was selected as the sampling unit with the inclusive and exclusive criteria such as follow:

1. Inclusive criteria
 - Workers who works at the shop lot along Jalan Mendaling to Jalan Sulaiman
 - Adult (20-60 years)
2. Exclusive criteria
 - Workers who have hearing problem

For the noise monitoring, 4 major monitoring points were chosen. For each major monitoring point, it consists of 1 point from the source and 2 point from the receiver. Overall, there were 12 monitoring point were selected with different distance from the road to carry out the noise measurement as shown in the Figure 1.

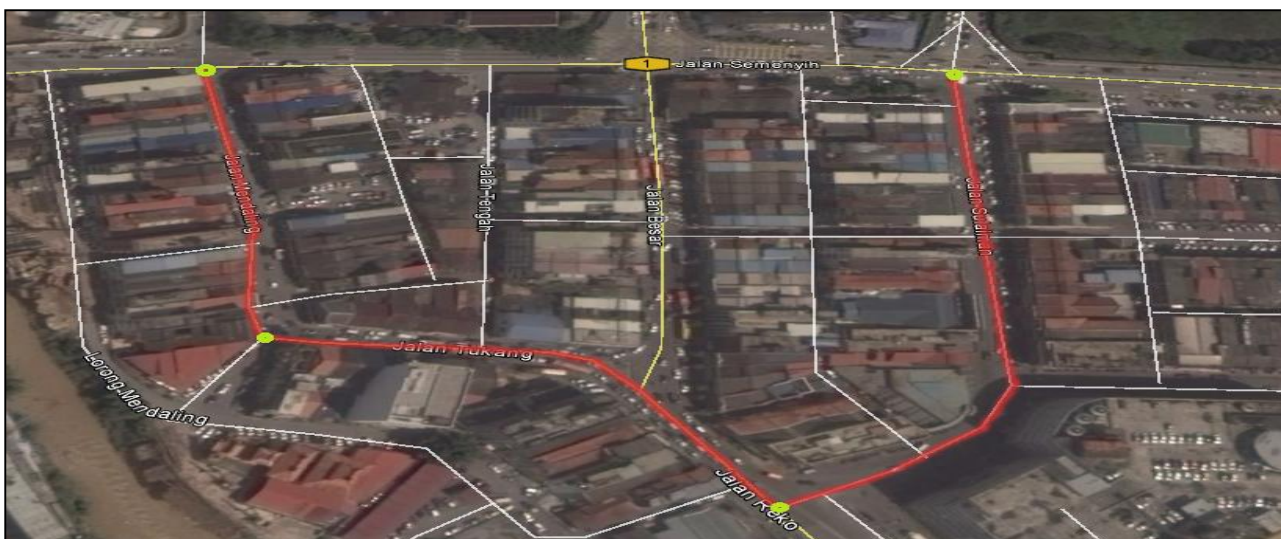


Figure 1 - Monitoring point
Source: Google earth (retrieved 12 May 2015)

The measurements were taken from 7 am until 7 pm (12 hours) on the same day. The noise measurement was done by using SOLO Sound Level Meter (Figure 2). Microphones were positioned at height 1.4 m above the ground, and at least 1m

from any other reflecting surfaces⁶. The parameters measured were Lmax, Laeq, and Lmin. To measure the potential effect of traffic noise, data on traffic volume consist of type and quantity of vehicle.



Figure 2 SOLO Sound Level Meter

The traffic volumes are taken manually using tally counter and video recording. Traffic volumes are measured at three times period per day. The periods are at the morning peak hour (07:15 - 09:15 AM), the day time peak hour (12:15 - 14:15 PM) and the evening peak hour (16:15 - 18:15 PM). The volume and composition of traffic will be measure for 15 minutes during each peak period. Traffic composition will be determine on the basis of the presence of light vehicles (cars, taxis), light lorry and vans, heavy lorries (truck trailer > 3.5 tons), buses and motorcycles. The type and quantity of vehicles that passes through the area were also recorded by using video recorder and tally counter.

In addition to that, questionnaire survey was carried out to evaluate the opinions of the shop lot workers about the traffic noise, work performance level and annoyance level from four

different sources at the traffic. The questionnaire comprised of 11 questions concerning socioeconomic and demographic data of the respondent, knowledge of the respondent on traffic noise, respondent perception of traffic noise and traffic volume level at the area, level of annoyance and level of work performance.

RESULTS

Traffic Volume

The type and total number of vehicles that recorded at the measuring point in Jalan Mendaling to Jalan Sulaiman are present in Table 1. It is visible that the total amount of vehicles that passes by the areas was more or less the same which is around 4429 of vehicles. The vehicle was categorized into 3 category which are category 1, category 2 and category 3.

Table 1 - Traffic volume at Jalan Mendaling, Jalan Tukang and Jalan Sulaiman

Time Taken	Vehicle Category	Traffic Volume Frequency	Percent (%)
7.15 - 9.15	Category 1	593	38.4
	Category 2	940	60.8
	Category 3	13	0.8
12.15 - 2.15	Category 1	469	37.3
	Category 2	771	61.4
	Category 3	16	1.3
4.15 - 6.15	Category 1	514	31.6
	Category 2	1096	67.4
	Category 3	17	1.0

* Category 1 = Motorcycle
 Category 2 = Car/Van
 Category 3 = Bus/Lorry/Others

Based on the Table 1, the traffic volume are high during 4.15 p.m until 6.15 p.m (1627 vehicles), followed at 7.15 a.m until 9.15 a.m (1546 vehicles) and lastly at 12.15 p.m until 2.15 p.m, where only 1256 vehicle are identified. At 4.15 p.m to 6.15 p.m, majority of vehicles in category 2 (67.4%) passing by at Jalan Mendaling to Jalan Sulaiman, while 514 of vehicles from category 1 are followed. In the morning, during 7.15 a.m to 9.15 a.m, majority of vehicle in category 2 (van

and car) also high with 940 vehicles while only 0.8% vehicle from category 3 passing by the road. Based on the table 4.2.4.1, 37.3% of the vehicles in category 1 and 1.3% vehicle from the category 3 are using the road from Jalan Mendaling to Jalan Sulaiman at 12.15 p.m until 2.15 p.m. Majority vehicles from category 2 which are car and van are passing by the road at each in 3 different time.

Traffic Noise Level

Figure 3 shows the traffic noise level at Kajang town. The average mean level of traffic noise at Jalan Mendaling to Jalan Sulaiman is 71.19 dB(A).

The traffic noise level is high, 75.83 dB(A) at 7 p.m and lowest, 65.18 dB(A) at 9 a.m. Based on the figure above, the traffic noise trend fluctuated from 7 a.m until 7 p.m.

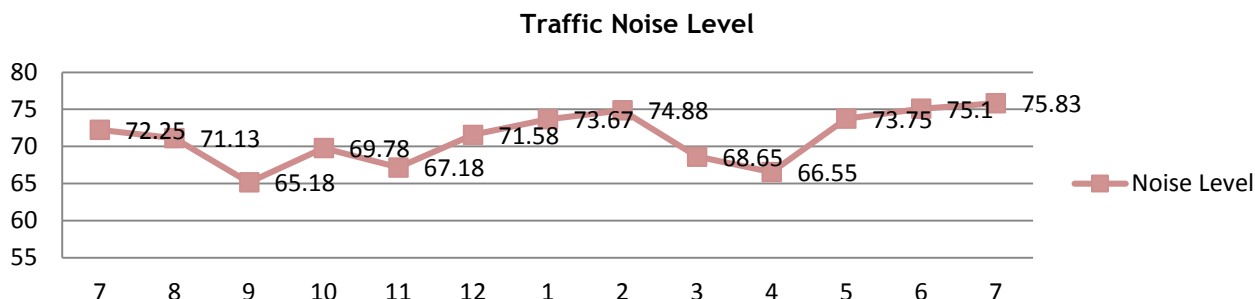


Figure 3: Noise Level Jalan Mendaling to Jalan Sulaiman

Level of Work Performance and Annoyance

From the calculated sample size, only 120 respondents were recruited to be respondent based on the exclusive and inclusive criteria. The respondent was selected among shop lot workers along Jalan Mendaling to Jalan Sulaiman who were exposed to the traffic noise during their working hours. For the socio-demographic characteristic, the respondents were predominantly by male which are 94 and female 21.7 % from 120 respondents. The mean age was ranged between 41 to 60 years old. Only 12.5% of respondent are ranged 21 until 30 years old. In total of 120 respondent, 54.2% of them are Chinese while Malay and India only 30% and 15.8% respectively.

In the questionnaire, 4 questions are being asked about the work performance and annoyance level of the respondent’s when they are exposure to the traffic noise. The questions regard the level of the work performance and annoyance during the exposure from the different sources of traffic noise which are:

- 1) Noise from the traffic
- 2) Noise from the exhaust system
- 3) Noise from the high traffic volume
- 4) Noise from the speeding vehicle

Table 2 and Table 3 present the result of the level work performance and annoyance from the traffic.

Table 2 - Noise and work performance of the respondent due to traffic

Work Performance Level	Frequency	Percent (%)
Very high	10	8.3
High	17	14.2
Low	48	40.0
Very Low	45	37.5

Table 3 - Noise and annoyance of the respondent due to traffic

Annoyance Level	Frequency	Percent (%)
Very Annoying	41	34.2
Annoying	46	38.3
Little Annoying	21	17.5
Not Annoying	12	10

The result of level work performance and annoyance from the exhaust system are interpreted in the Table 4 and 5. Based on the

Table 4, majority of the 50 respondent, are having low work performance. Based on the Table 5, majority of 59 respondents are having annoying.

Table 4 - Noise and work performance of the respondent due to exhaust system

Work Performance Level	Frequency	Percent (%)
Very high	5	4.2
High	19	15.8
Low	50	41.7
Very Low	46	38.3

Table 5 - Noise and annoyance of the respondent due to exhaust system

Annoyance Level	Frequency	Percent (%)
Very Annoying	30	25.0
Annoying	59	49.2
Little Annoying	21	17.5
Not Annoying	10	8.3

In determine the level of work performance and annoyance from the high traffic volume, Table 6 and Table 7 indicates the result. Based on the Table 6, majority of 44.2% from the 120 respondent, are having low work performance followed by 51 respondents who having very low

work performance when expose to traffic noise from high traffic volume. Based on the Table 7, majority of the respondent, 46.7% are having very annoying level followed by 49 respondents who having annoying when expose to noise from the high traffic volume.

Table 6 - Noise and work performance of the respondent due to high traffic volume

Work Performance Level	Frequency	Percent (%)
Very high	3	2.5
High	13	10.8
Low	53	44.2
Very Low	51	42.5

Table 7 - Noise and annoyance of the respondent due to high traffic volume

Annoyance Level	Frequency	Percent (%)
Very Annoying	56	46.7
Annoying	49	40.8
Little Annoying	12	10.0
Not Annoying	3	2.5

Table 8 and Table 9 interpret the result for determine the level of work performance and annoyance from the speeding vehicle. Based on the Table 8, majority of the 51 respondent, are having low work performance followed by 33.3% of respondent who having very low work

performance when expose to noise from speeding vehicle. Based on the Table 9, majority of 45 respondents are having very annoying level followed by 36.7% of respondents who are annoying when expose to noise from the speeding vehicle.

Table 8 - Noise and work performance of the respondent due to speeding vehicle

Work Performance Level	Frequency	Percent (%)
Very high	11	9.2
High	18	15.0
Low	51	42.5
Very Low	40	33.3

Table 9: Noise and annoyance of the respondent due to speeding vehicle

Annoyance Level	Frequency	Percent (%)
Very Annoying	45	37.5
Annoying	44	36.7
Little Annoying	23	19.2
Not Annoying	8	6.7

Figure 4 described the overall level of work performance and annoyance from the total 120 respondent. Majority 94 of the respondents are having low work performance during the exposure of the noise from the traffic density, vehicles, high traffic volume, and vehicle exhaust.

Meanwhile, only 22% of the respondent does not have any difficulties during the exposure from the traffic noise. Moreover, 98 of the respondents are having high annoyance level during the exposure of the noise from the traffic density, vehicles, high traffic volume, and vehicle exhaust.

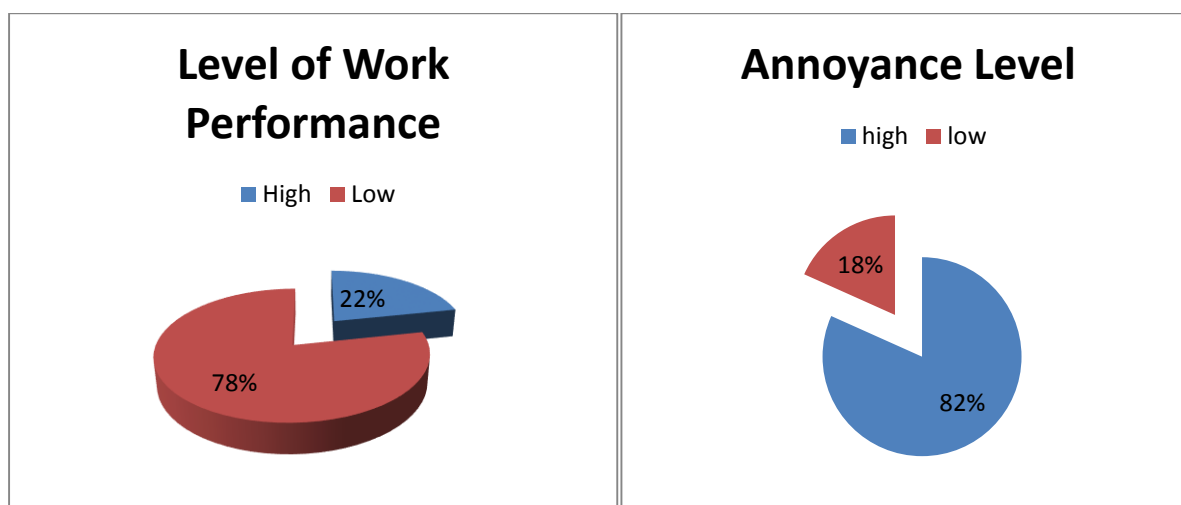


Figure 4 - Overall level of work performance and relationship between traffic noise level and work performance level

In order to determine the relationship between traffic noise and level of work performance, among the respondent, Pearson’s Chi Square statistic test is used. Table 10 described the Pearson’s Chi Square statistic test.

The Pearson’s Chi Square statistic is 23.163 and the degree of freedom is 1. The p-value test is <0.001 which is less than 0.05. There is an association between noise level and work performance level.

Table 10 - Relationship between traffic noise level and work performance level among respondent

Variable	Work Performance		χ^2	p	
	High	Low			
Noise Level	Below Standard	20 (45.5%)	24 (54.5%)	23.163	<0.001
	Above Standard	6 (7.9%)	70 (92.1%)		

n = 120

Relationship Between Traffic Noise Level And Annoyance Level

In order to determine the relationship between traffic noise and annoyance level among the

respondent, Pearson’s Chi Square statistic test is used. Table 11 described the Pearson’s Chi Square statistic test.

Table 11 - Relationship between traffic noise level and annoyance level among respondent

Variable		Annoyance		χ^2	p
		High	Low		
Noise Level	Below Standard	31 (70.5%)	13 (29.5%)	5.833	0.026
	Above Standard	67 (81.7%)	22 (18.3%)		

n = 120

The Pearson’s Chi Square statistic is 5.833 and the degree of freedom is 1. The p-value test is 0.026 which is less than 0.05. There is an association between noise levels.

DISCUSSION

The study showed that the respondents were exposed to high traffic noise level (Laeq) during their working hours. The exposure from traffic noise give an auditory effect to the workers which is high annoyance and low work performance. Moreover, there is no protected equipment used by the respondent in order to reduce the exposure of the traffic noise. The findings of this study were stated as follows:

- a) There were high traffic volume at Jalan Mendaling, Jalan Tukang and Jalan Sulaiman where the highest at the evening (4.15 p.m to 6.15 p.m)
- b) The traffic noise level at Jalan Mendaling, Jalan Tukang and Jalan Sulaiman were higher with 71.19 dB(A) Laeq. It is exceeding the permissible sound level from road traffic, commercial and business place at day time.
- c) The work performance level among the respondent is low during the exposure of traffic noise
- d) The annoyance level of the respondent is high during the exposure of the traffic noise.
- e) There is a significant relationship between the traffic noise level and work performance level among the shop lot workers. The null hypothesis is rejected
- f) There is a significant relationship between the traffic noise level and annoyance level among the shop lot workers. The null hypothesis is rejected

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COMPETING INTERESTS

There is no conflict of interest.

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