



# Noise From Workshop Power Equipment/Tools As A Stressor Affecting Students' Task Performance In Workshop Practice

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## Abstract

The study determined students' perception of noise from workshop power equipment/tools as a stressor affecting task performance in workshop practice. The study used 112 Nigeria Certificate in education (NCE) Technical students in 300 Level for the study. The Noise Stressor and Performance Questionnaire (NSPQ) were used to collect data. The reliability of the instrument was 0.55 using the Cronbach Alpha coefficient test. Data was analyzed using Arithmetic Mean, Standard Deviation; and the hypothesis was tested with Chi-square ( $X^2$ ) at 0.05 level of significance. Also, the students perceived noise as a stressor that affected task performance in workshop practice. The ( $X^2$ ) result revealed that the perception students did not show preference for any of the stress indicators as stressor that, affected task performance in workshop practice. It was recommended that, noise from workshop power equipment/tools which affected students to exhibit stress-related behaviours should be reduced below threshold for them to carry out effective task performance in workshop Practice.

**Keywords:** task, workshop; noise; stressor; stress; equipment/tools; performance; practice

## 1. Introduction

Noise is an unwanted sound or an extraneous sound [1, 2, 3, 4]. Noise is also a wrong sound in the wrong place at the wrong time [5,6]. Noise according to [7] is an auditory stimulus bearing no informational relationship to the presence or completion of the immediate task. [8] described noise as a sound without value, it is unwanted, unpleasant or disagreeable sound that cause discomfort and undesired by the recipient. Also [9] reported that noise is a sound or sounds at such amplitude as to cause annoyance or to interfere with communication. Further, [10] defined noise as any sound that interferes with our ability to gather useful information from the world around, that impairs our pursuit of some activity (e.g. sleeping or talking with a friend or performing some work function), or that merely annoys us. According to [11] noise is any unwanted, disturbing, or harmful sound that impairs or interferes with hearing, causes stress, hampers concentration and work efficiency or causes accidents. In addition, [12] described noise as a sound that causes irritation on the hearing of healthy human being.

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Noise can be emitted from machines, equipment and tools. Industrial noise involves motors and machinery in numerous factories, industries and mills [8,10]. Machines in industrial and manufacturing process produces noise when the moving parts rub against each other or strike each other or simply vibrate [10]. Construction noise originates from pneumatic power machines used in cutting or drilling, concrete mixers, block moulding machines, hoists, cranes, dumpers, etc [6]. Industrial noise particularly from mechanical saws and pneumatic drills are unbearable and a nuisance to the public.

A person's reaction to noise as a stressor mostly involves subjectivity because it cannot be measured [10]; and of all the pollutants, noise is the only one that does not leave a residue [8]. Therefore, noise as a stressor causes stresses in individuals when it produces stress behaviours such as irritation, disturbance, annoyance, distraction, mental fatigue, hearing impairment and affects our ability to concentrate and increase work output [9,10]. Noise is a source of annoyance for people exposed to it; with some kind of noises more annoying than others. Though, the types and levels of noise that do so are difficult to determine but depends on how much the noise is unwanted. Annoyance therefore is a frequent result when our mood or emotional strata does not enable us to respond with grace to a noise [10]. Many persons who have been exposed to certain noises over long periods of time develop tolerance so that they may not even hear the noises without conscious effort. The same noises may annoy other persons who have not developed the tolerance to such a degree that their efficiency is degraded. They may become more prone to make errors, leading to accidents [13]. However, the louder the noise, the more annoying it can be, especially when it is emitted from sources that we cannot control [3]. The extent of annoyance from intrusive sound depends on the sound level and its duration, the listener, the type of use and activity being undertaken at that time. However, it is not possible to state noise levels below which no one will be annoyed and above which everybody will be annoyed [14]. Noise also distracts especially when talking to a person in the vicinity can distract the attention of other persons even if it does not annoy them. In this regard, [13] observed that accidents have occurred when persons engaged in hazardous activities were spoken to, thus distracting their attention momentarily so that they failed to respond during critical instant.

Uncontrollable noise is more arousing, stressful; and more difficult to adapt to; and requires more attention than it is with controllable noise. Lack of control over noise can lead to psychological reactant and one may attempt to regain freedom of action by trying to assert control. If such efforts are unsuccessful, learned helplessness can result. Noise interferes with the ability to communicate with speech. Most human work depends on verbal communication; and interference with communications can create misunderstandings about information transmitted from one person to another. And when such communications relate to hazardous activities, concentration will suffer and any misunderstanding can lead to accidents. But the degree of interference with speech communication from intensive noise depends on the distance between the talker and the listener, the noise level, and on whether the voice is normal or increased [14]. People exposed to noise will therefore experience auditory fatigue and hearing impairment that interferes with receipt of sound and the understanding of speech in sentence form [13, 2].

Physiological damage to the ear due to noise occurs when the mechanisms of the ear are incapable of providing self- protection. When noise is very loud and of sufficient duration; it will induce great air pressure which causes damage to the eardrum [13]. The amount of hearing damage varies with the sound levels, length and number of times one is exposure, and individuals' susceptibility to noise. So, for a person with hearing loss, what is actually heard can often appear distorted [10]. Health or physiological effects may accompany exposure to noise due to stress reactions. Most industrial workers, who are exposed to job-related noise, have been found to experience increased anxiety, arousal, and the feeling of psychological stress. A sudden loud noise will increase aggravate the release of the adrenaline gland into the blood, as the body instinctively prepares to defend itself. This causes fatigue, irritability, headache and anxiety in industrial workers [8, 13, 2].

The noise that causes stresses, also hampers concentration, and causes reduction in the performance of skilled tasks both in terms of production quality and work rates. However, whether noise affects performance adversely, favourably, or not at depends on the intensity, predictability, controllability, the type of task performed, and stress tolerance and other personality characteristics of the individual [5, 10, 11]. Noise interferes with task performance by masking important information thereby making the task more difficult to perform. Task performance is impaired because noise masks the auditory feedback or inner speech by blocking an individual performing a task being able to "hear themselves" think [9, 3]. When inner speech is blocked or cannot be used, noise has more negative effects on task performance or leads to slower performance.

Noise interferes with speech communication and masks useful sounds that characterize the work procedure [10, 6]. This usually leads to less efficiency in operation and the ability to perform complex tasks. Further, noise funnels/narrows of an individual performing a task to only the most important aspects of a task leaving out some peripheral information that may also be relevant to the task performance. That is poorer recall of peripheral information available during a task or rarely used information [3] and this could lead to performance decrement. In another report [7] also observed that at high noise levels, a person typically focuses attention on the most important aspects of task and performance usually suffers if relevant task information is missed owing to this funnelling phenomenon. Thus, work requiring high degree of skill and precision is considerably affected by lack of concentration from noise effect. Noise that causes distraction, disturbance and irritation induces lack of concentration on individuals and this had led to performance decrement. The mildest effect of noise is often physical or mental fatigue and lack of concentration. In industrial situations, this has resulted to low efficiency, reduced work rate, and high potentials for accidents and injuries [2, 15, 12]. In addition, noise affects performance of tasks negatively when the noise generated is not a necessary accompaniment to the job. It affects performance in terms of energy loss, arousal, accuracy, motor performance, mental performance, continuous work without rest as well as when two jobs are to be performed simultaneously [15]. However, noise only reduces the accuracy and quality of task performance but do not affect the quantity of production adversely [6,10]. Further, noise affects motor and mental performance under long exposure. Noise increases worker fatigue, slows motor reflexes leads to mistakes in delicate work and impairs performance where balance is involved [7, 8, 10]. However, total productivity in heavy works may not be decreased. Noise also affects perceptual motor tasks when work is continuous without rest pauses by creating gaps in performance where no recorded response is made [7]. However, the overall performance may not suffer, but the variability in performances increases. Noise affects the performance of vigilance and complex task especially when an individual must perform two activities simultaneously by momentarily distracting an individual from a task and thereby causing errors [3]. That is, where two tasks are carried out simultaneously it can reduce accuracy in vigilance and precision tasks if the noise is very loud.

In this study, therefore, noise which impinges and threatens the well-being of a person is considered as a stressor while the reaction to the effect of noise stressor on individuals is considered as stress [3]. Further, noise as a stressor has been established to have relative effect on individuals' task performance, and this necessitated the study. The purpose of the study is therefore to determine students' perception of noise from workshop power equipment/tools as a stressor affecting their task performance in workshop practice. The specific objective is to establish the extent to which students perceive noise from school workshop as a stressor affecting their task performance in workshop practice; and to establish whether students will show significant preference for any of the noise stresses from workshop equipment/power tools that affect their workshop practice.

## **2. Material and Methods**

### *2.1 Participants*

One hundred and twelve 300 Level NCE Technical Education students from the Federal College of Education (Technical) Omoku Rivers State during the 2008/2009 academic session participated in the study; and there was no sample because the population was manageable. The 300 Level students were chosen for the study because they offer the entire courses listed in the first and second years of the NCE technical programme before choosing an area of specialization in the 300 Level [16]. The NCE (Technical) programme has duration of three years leading to the award of the Nigeria Certificate in education. The colleges were funded by the Federal Government of Nigeria with common workshops used for workshop practice and the students were expected to have reasonable knowledge of workshop practice.

### *2.2 Data collection*

Data for the study was collected using the Noise Stressor and Performance Questionnaire (NSPQ) designed to elicit students' perception of noise from workshop equipment/power tools as stressor affecting their task performance in workshop practice. The NSPQ instrument contained six items in form of statements and had five response options of; very great extent (VGE), great extent (GE), moderate extent (ME), low extent (LE), and very low extent (VLE) using the 5-point scale.

The NSPQ was face-validated by professional colleagues at the Federal College of Education (Technical), Omoku. The reliability of the instrument was tested by using 30 NCE Technical students in 300 Level at Federal College of Education (Technical), Umunze, Anambra State, Nigeria during the 2008/2009 academic session who were not part of the study. The college was used for the test because it ran the same NCE Technical Education programme. The Cronbach Alpha Coefficient test result was 0.55 indicating the reliability of the (NSPQ) instrument.

The Noise Stressor and Performance Questionnaire (ESPQ) were administered to the 300 Level NCE (Technical) students by the researcher. The students were given a week to submit the completed questionnaire. Retrieval of questionnaire was 97 out of 112 copies administered, representing 86.60 percent.

Data was analyzed using Arithmetic mean and standard deviation to establish the extent to which the students perceive noise as a stressor affecting their task performance in workshop practice. The Chi-square ( $X^2$ ) test at 0.05 level of significance was used to establish whether the students show significant preference for any of the noise induced stresses affecting their task performance in workshop practice. With a 5-point scale, the decision rule assigned to the students' perception scores were: very great extent, (4.50-5.00); great extent, (3.50-4.49); moderate extent, (2.50-3.49); low extent, (1.50-2.49); and very low extent, (1.00-1.49). Further, if the calculated ( $X^2$ ) is equal to or greater than the critical table value, reject the null hypothesis and if it is otherwise, do not reject the null hypothesis.

### 3. Results

The results of the students' perception scores in Table 1 revealed that noise as a stressor affected task performance in workshop practice to a great extent with Grand Perception Mean ( $\bar{x}_G$ ) scores of 4.09.

Table 1: Students' mean perception scores on noise as a stressor affecting their task performance in workshop practice

Noise stress indicators	<b>X</b>	<b>SD</b>
Decision		
1. Noise from machines causes irritation (restlessness) which affects tasks requiring greater efficiency. Great extent	4.11	1.15
2. Noise from machines/power hand tools brings about disturbance (interruption) which affects two motor performance tasks carried out simultaneously. Great extent	4.14	1.04
3. Noise from machines/power hand tools causes distraction (lack of attention) which affects speed of work. Great extent	3.90	1.10
4. Noise from machines/power hand tools causes annoyance (anger) which affects accuracy of precision tasks. Great extent	3.96	1.07

5. Noise from machines causes mental fatigue (lack of concentration)		
which affects uniformity in task performance.	4.27	0.92
Great extent		
6. Noise from machines/power hand tools impaired hearing which		
affects tasks requiring speech communication.	4.16	1.14
Great extent		
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Grand ( $\bar{x}_G$ )		4.09
1.07 / Great extent		

The Grand Mean Standard Deviations ( $\bar{x}_G$ ) of 1.07 of the students' perception scores were small, clustered and close to the mean. This indicated that, the students' perception responses had a small variability and therefore homogeneous.

The results of the finding on whether students will show significant preference for any of the noise stresses from workshop equipment/power tools that affected task performance in workshop practice in Table 2 indicated that with  $X^2$ -Calculated of 27.63 less than the critical value of 13.41; the null hypothesis was not rejected. At  $P \leq 0.05$ , the students did not show significant preference for any of the noise stresses from workshop equipment/power tools that affected task performance in workshop practice. That is, all the assessed stress indicators affected work practice.

Table 2: Chi-square ( $X^2$ ) test for significant preference

Noise stress indicators	VGE	GE	ME	LE	VLE	( $X^2$ )Cal	( $X^2$ )Table	df	Decision
1	49(44.8)	25(28.8)	14(11.8)	3(6)	6(3.3)	5.01	31.41	20	Not significant
2	44(44.8)	33(28.8)	13(11.8)	4(6)	3(3.3)	3.63			
3	34(44.8)	35(28.8)	16(11.8)	8(6)	4(3.3)	6.24			
4	39(44.8)	29(28.8)	17(11.8)	10(6)	2(3.3)	6.22			
5	51(44.8)	27(28.8)	13(11.8)	6(6)	0(3.3)	4.40			
6	52(44.8)	24(28.8)	11(11.8)	5(6)	5(3.3)	2.13			
Total	269	173	71	36	20	27.63			

#### **4. Discussion**

From the findings, it was the perception of the students that noise from machines, equipment and power hand tools in the school workshop which caused irritation (restlessness), disturbance (interruption), distraction (lack of attention) annoyance (anger), mental fatigue (lack of concentration); and impaired hearing affected task performance in motor tasks, speed of work, accuracy, uniformity, and tasks requiring speech communication during workshop practice. This finding was consistent with [17, 8] where they reported that noise stresses emanating from machines, etc in factories and other industrial set up affected the task performance of individuals. Therefore, when excessive noise produced by machines, equipment etc is not minimized in the workshops; students will exhibit noise-related stress-behaviours such as irritation, disturbance, distraction, annoyance, mental fatigue, and impaired hearing which in turn affect their task performance in workshop practice.

Further, the perception of the students did not show significant preference for any of the noise stress indicators as stressor affecting task performance in workshop practice. From this finding, it was therefore the perception of the students that irritation (restlessness), disturbance (interruption), distraction (lack of attention), annoyance (anger), mental fatigue (lack of concentration) and hearing impairment as noise stresses negatively affected their task performance in workshop practice. This finding is in line with studies carried out by [17] where it was reported that noise bothered employees at work and that noisier work places reduced job satisfaction. It was also established by [18,19] that noise not only impairs hearing ability but noise also hindered speed, accuracy and uniformity in task performance. It therefore means that noise as stressor affected students' task performance in terms of uniformity, variability and work accuracy.

#### **5. Conclusion/recommendations**

The study established that, noise from workshop power equipment/tools as perceived by students as stressor affected task performance in workshop practice. Further, the perception of the students did not show a particular preference for any of the stress indicator that affected task performance in workshop practice. The significance of the study was that, no meaningful workshop practice can take place in a school workshop that is characterized by noise stressor from machines/power tools that induces stresses in students. And through scholarly publication of the findings, stakeholders concerned with workshop related programmes shall become aware that noise from machines/power tools can also affect students' workshop practice even where students are taught by competent and qualified teachers.

However, to improve on the present study, a pilot study where students will carry out task performance while exposed to the present noise levels from machines/power tools should be conducted. The performance levels between gender groups should also be ascertained. In addition, a similar study should be carried out based on a gender groups to establish whether their perceptions of noise from machines/power tools as stressor affecting workshop practice shall differ.

Based on the findings of the study, the following recommendations have been made: Noise levels from machines/equipment and other power tools should be reduced to enhance students' task performance in workshop practice. This can be achieved through periodic and regular maintenance to keep the machines free from chatter, impact and vibration-generating motion. And where the noise levels of machines are due to frictions of moving parts, loose, worn-out or unbalanced machine parts, such defective parts should be replaced, adjusted, tightened, repaired and lubricated timely.

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