AN EVALUATION OF THE EFFECTS OF NOISE ON STUDENTS IN THE MAIN LIBRARY OF UNIVERSITI TEKNOLOGI MALAYSIA

Dodo M., & Abubakar M.
Department of Building, Ahmadu Bello University Zaria, Nigeria
mansirdol4@yahoo.com

Abstract

The physical environment of a building should be within an optimal control level well enough to satisfy the needs of its occupants. Noise as a pollutant affects the productivity and morale of people. This paper investigates student's perception on the effects of noise in the Main Library of Universiti Teknologi Malaysia. Two hundred and sixty five students that come from over fifteen countries were surveyed. A structured questionnaire was used to collect data on student's perception to noise and its subsequent effect. Eta cross tabulation was used to establish relationships on the effects of noise and students perception. Results reveal positive relationships with small, medium and large categories of effects. Furthermore, while headache, feeling heavy headed and lack of concentration, were significantly related to student's perception, all other effects were not. As such, findings revealed that the more noise is perceived not manageable, the more its effect on headache, feeling heavy headed and lack of concentration towards the students. It was thus concluded that noise affects students in the library and can lower productivity in reading and learning of the students. The study recommends that sources of noise should be improved upon through adequate education and enforcement of library regulations.

Keywords: Effects; library; noise; perception; and students.

Introduction

Several environmental conditions which cause discomfort to a building occupant can have negative influences to the performance of any task. The source of such discomfort could be attributed to the building's design/construction, its mode of operation or other surrounding circumstances. Enough evidence to support any claim related to such discomforts must be provided before developing the criteria for evaluating the performance of such building. As such, Edwin and Chan (2008) in their research concluded that an excellent indoor environment boosts an occupant's productivity.

Noise is unpleasant sound created by people and machines that can be annoying, distracting, intrusive and/or physically painful (Mudutgap, 2011). Noise that is beyond the acceptable standards have health associated effects and become harmful and defective to hearing. Thad (1995) asserts that noise affects the productivity and morale of people and as such, humans react to noise in different manners.

Researches like works of Bond (1996); Kieman (1997); Bhagarwa (2001) and Andrew and Michael (2009) have been conducted on noise pollution and its effects on health, functionality, human activities, social behavior, teaching and learning activities. Other studies (like Akande and Owoyemi 2008 and; Barry, 2008) have shown that concentration level in a quiet

environment is usually higher compared with a noisy environment.

Nelson et. al. (2002) opined that noise has an impact on student learning by hindering cognitive functioning and impairing reading concentration skills. Thus, for a library where most of the working areas are for reading and learning, there is the need to study the effect of noise which impedes the libraries core activity.

This research intends to study noise effects on the users of the Main Library (PSZ) of Universiti Teknologi Malaysia (UTM) with a view to ascertain the perception of the students on such effects. The study however only covers the student's perceptions to noise and its associated effects.

Noise in Libraries and its Perceptions

In any academic environment, the library is an essential component of an institution's intellectual expression. Libraries must design and operate their spaces in a way that meets the needs of learning, teaching, and research (Adrian and Bill, 1998). Therefore, noise is one of the most important physical properties that determine how well a library can serve its primary function. Libraries are often used by students as a quiet place for study and research. Libraries according to Mudutgap (2011) serve the following purposes:

Protect and preserve the archives, audiovisual materials, and artifacts;

Provide access to the historical materials for research and other purposes;

Provide museum space to communicate the life and times of people through permanent and temporary exhibits;

Provide education programs to further the public's knowledge; and

Provide working space for the archival, curatorial, and educational staff that process and make available the collections of the library.

As such, libraries should function to serve the needs of a diverse service population including small children, students, professionals, and the elderly.

Sanjeev et. al., (2007) asserts that a satisfactory indoor acoustical environment should be always aimed at in a library design and operation. Noise no matter how little is unacceptable in a library. Vyla and Gill (1998) are of the opinion that noise can give rise to psychological effects which can lead to loss in concentration to users of a library. While noise of high pitches are totally unacceptable in a library, some lesser louder noises are still considered irritating for example, a persistent ring of a phone or the beep of a computer terminal.

Noise can be relatively influenced by furniture arrangement therefore, instances where the echoes from the slightest noise heightened throughout a library must be avoided (Rowe, 1994). According to James (1994), noise in libraries from equipment's such as computers, printers, photocopiers etc could be reduced by installing acoustic hoods, using quiet mode printing facility and by the use of screens with sound-absorbing materials.

If not curtailed, noise can cause serious inference to an occupant. Different perception factors (psychological and physiological) that vary between individuals determine whether or not the noise is disturbing or annoying to a library occupant. As such, noise sources must be prevented or its transmission pathways deadened or minimized.

Effects of Noise

Noise affects human health adversely. The effects of noise are difficult to quantify because tolerance levels among different populace and types of noise vary considerably. According to Nyuk and Wy (2003), noise effects can be grouped as:

Effects on physical health: this can be as a result of acute effects which depend on high pressure and frequency and time of exposure to noise; immediate permanent hearing damage can be caused. For this reason, a person exposed to high levels of noise goes deaf more easily than he/she would have. At low levels however, loss of physical control and physiological changes caused by stress are noticed. The effect cease with the stop of the noise or sometimes after a time delay.

Effects on mental health: There are some temporary effects such as lack of concentration, and at high levels of mental disorientation. There is also a tendency that noise aggravates existing mental conditions.

Effects on working efficiency: Noise has an effect on work output because people tend to lose concentration with noise which causes a rise in error.

Effects on personal comfort: This depends largely on pressure, frequency and time of exposure. At levels below those that cause rapid hearing damage, noise becomes intrusive, interferes with speech communication and the peaceful enjoyment of leisure. These effects which are essentially nuisance vary and are difficult to assess from individual to individual and can also be tolerable with continuous exposure.

Effects on Communication; Noise interferes with communication especially when the frequency of an interfering sound coincides with that of the desired sound.

Noise problems are considered next to crime by certain countries due to the danger posed by their worrisome effects. Rao (2007) asserts that in China, till third century B.C., instead of hanging men for dangerous crimes, noise was used for their torturing. The effects of noise if so severe can lead to permanent loss of memory or a psychiatric disorder (Bond, 1996). According to Reginald, (2002), noise may result in loss of hearing, stress, high-blood pressure, annoyance, speech interference, sleep disturbance, mental stress, headache, lack of concentration, distraction affecting productivity and a general reduction in the quality of life. It may cause deafness, nervous breakdown, mental disorder, heart troubles, high blood pressure, dizziness and insomnia (Bhargawa, 2001).Similarly Rousseau and Wesley (1997) noted that the workers exposed to high noise levels have a higher incidence of circulatory problems, cardiac diseases, hypertension, peptic ulcers, and neuro-sensory and motor impairment. Excessive noise and prolonged exposure to noise can cause mental stress, headache, dizziness, drowsiness, fatigue, nausea, ringing in the ears and irritation which subsequently portray a great impact on students comfort (Nelson et. al., 2002).With all such, it must be emphasized that poor acoustics environment in libraries leads to annoyance, stress and development of poor comprehension by its users.

Main Library of Universiti Teknologi Malaysia

Universiti Teknologi Malaysia (UTM) is a public Engineering and Technological university with its main campus located at Johor in Malaysia

and a branch campus in JalanSemarak, in Kuala Lumpur. UTM has more than 16 thousand full-time undergraduate students (with also more than 5 thousand enrolled on distance learning programmes as part-time students). In addition, there are more than 6 thousand postgraduate students in various fields of specialization. Since the 1990s, the number of foreign students of UTM (from neighboring Asian countries, the Middle East, and Africa) has been increasing, especially in the post-graduate programs.

The main library of UTM otherwise called Perpustakaan Sultanah Zanariah (PSZ) is situated in a central location at UTM's main campus in Skudai, Johor Bharu. It is a four-storey building having a seating capacity of 3,422. It has a collection of over half a million volumes and also has a total of 179 staff. The core activities of PSZ which serve as an integral component of the academic program in UTM are reading, learning and research.

Methodology

Simple random sampling was used for this study. University students were drawn randomly with each having an equal probability from the study population owning to the fact that they in one way or the other share some attribute and/or characteristic. Data obtained from Library Management shows that a total of 1,324 students used the library (the case study building) on 12th April, 2010. This constitutes a peak use thus it is adopted as the targeted population of this research as a means to relate the works of Thad (1995) and Ertugrul *et. al.* (2004), 20% (265) of this number (1,324) constitute the sampling frame of this research.

Since the overall return rate for the questionnaires in the work of Morris and Dennison (2005) was about 75%, a minimum equivalent return rate in this research will justify the objectives of this research.

Research Tool

A structured questionnaire was used for this research. The scale used regarding assessing noise rating are: Too noisy (1); Noisy(2); Manageable (3); Quiet (4); and; Too quiet (5). The following scale was also used in relation to noise effects regarding student's perception: Not contented (1); Seldom contented (2); Manageable (3); Most times contented (4) and; Very contented (5).

Correlation Parameters

As was highlighted by Andrew and Michelle (2009), the most important associational statistic to use to depict the strength of a relationship when one variable is nominal/categorical (noise effects) and the other is ordinal (noise source) is Cross-tabulation using Eta. As reported by Barry (2008), Eta is a coefficient of nonlinear association used as a measure of effect size and/or strength of a relationship. Furthermore, Eta squared describes how much variability in the dependent variable (effects) is associated with the variability in the independent variable (noise source). Values of Eta range from 0 to about +1.

Table 1:Range of values of effect size of Eta square

Effect	Range
Small effect size	- 0.059
Medium effect size	0.06 - 0.16
Large effect size	>0.17

Source: Barry (2008)

Results and Discussion

A total of 265 questionnaires were distributed and a total of 234 (88.30%) were successfully retrieved in the field survey conducted in the study. The overall return rate for the questionnaires in the work of Morris and Dennison (2005) was about 75%, as such the return rate of this research is justifiable.

Respondents Duration in Use of Library

Table 2 shows that 50.85% of the respondents stay in the library for less than 3 hours, 44.87% stay between 4-6 hours and 4.27% stay for over seven hours. Even though the library is opened for 14 hours on working days and 8 hours on weekends, more than half of the respondents use the library for a maximum of 3 hours. This is not encouraging because the research was conducted during a peak use period.

Table 2: Duration of respondents in library

Duration of stay	Number of respondents (No.)	Percentage of respondents (%)
Less than 3 hours	119	50.85
Between 4-6 hours	105	44.87
Over seven hours	10	4.27
Total	234	100

Noise Rating and Satisfaction Level

Figure 2shows perceived Noise Rating of students. Results show that 7%of the students opine the library to being 'too noisy', 18% believe it is 'noisy', 35% feel noise is 'manageable', 31% opine the library is 'quiet' and 9% believe the library is 'too quiet'. It may thus be inferred that one-quarter of the respondents perceive the library to being noisy while the remaining three-quarters find it manageably quiet.

Results of respondent's satisfaction level on noise shows that 6% are 'not contented', 9% are 'seldom contented', 39% feel it is manageable', 36% are 'most times contented and 10% are 'very contented'. Such is depicted in Figure 2.

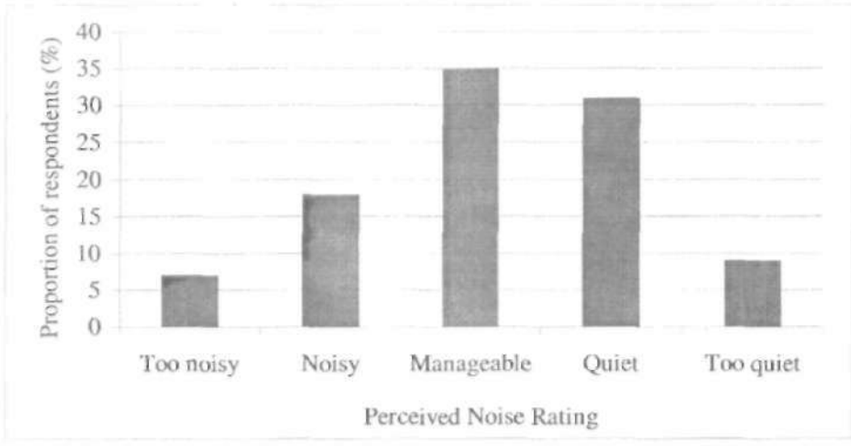


Figure 1: Students Noise Rating
Source: Field survey (2010)

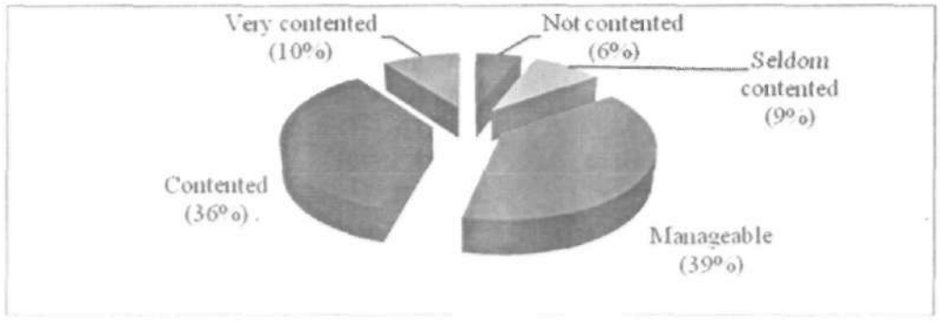


Figure 2: Noise Perception Level
Source: Field survey (2010)

These results reveal that 85% of the respondents are manageably contended regarding their satisfaction to noise in the library. The remaining 15% of the respondents are not contended with the noise.

Comparing these results with that of Figure 1, it may be concluded that 10% of the respondents while finding the library noisy are manageably contended with it.

Effects of Noise and Student's Perception

Relationships between effects from noise studied and the noise source tolerance of students are all positive in this study. They all range from a 'small effect size' to a 'medium effect-size' (Refer to Table 1).The positivity in relationships and the effect sizes are all considered satisfactory in assessing Indoor Environmental Quality relating to Noise from works of Barry (2008) and Andrew and Michael (2009). Results are as shown in Table 3.

Table 3: Eta square values from correlating effects of noise and students perception

Noise Effects	Eta square values	Effect size
Headache	0.080	Medium
Feeling heavy headed	0.050	Medium
Back strain	0.095	Medium
Increased blood pressure	0.111	Medium
Muscle strain	0.095	Medium
Stress	0.162	Medium
Fatigue/tiredness	0.046	Small
Lack of concentration	0.110	Medium
Other symptoms	0.057	Small

Source: Field survey (2010)

Further analysis reveals the level of significance between noise effects studied and the noise perception of students as depicted in Table 4.

Table 4: Significance levels of effects from noise as against student's perception

Noise effect	Significance level (p)
Headache	0.000
Feeling heavy headed	0.000
Back strain	0.001
Increased blood pressure	0.005
Muscle strain	0.001
Stress	0.001
Fatigue/tiredness	0.006
Lack of concentration	0.000
Other effects	0.176

Significant for $p < 0.001$
Source: Field survey (2010)

From Table 4, there is a significant relationship (for $p < 0.001$) between student's perception as against headache, feeling heavy headed and lack of concentration. All other effects studied: back strain, increased blood pressure, muscle strain, stress, fatigue/tiredness and other effects, although having a positive relationship with noise are not significantly related with it (for $p < 0.001$).

Summary of Findings

Results against the backdrop shows that more than 51% of the respondents using the main library of UniversitiTeknologi Malaysia stay in it for less than three hours during peak period. It seems obvious that there may be a cause because the proportion is unappealing. Furthermore, amongst the noise effects studied, results indicate that only headache, feeling heavy headed and lack of concentration are significantly related to student's perception in relation to noise sources experienced by the respondents. This implies that the higher the effect of headache, feeling heavy headed and lack of concentration on the students, the higher they affect their perception on noise and vice versa. These results signify that the more the noise is perceived not manageable (established against the backdrop), the more its effect on headache, feeling heavy

headed and lack of concentration towards the students.

Conclusion

It can be concluded that noise affect students in the main library of UniversitiTeknologi Malaysia and can lower productivity in reading and learning of the students as is established against the backdrop by works of Thad (1995), Vyla and Gill (1998), Nelson et. al., (2002), and Reginald (2002).

Recommendations

In line with the variables studied, this study recommends the following:

Library management should seek for measures to fully enforce adherence to all rules and regulations related to noise sources. Penalties or the like should be imposed on students caught wanting;

Orientation on the use of library should be conducted from time to timeto students.

References

Addison, J.; Dancer, J.; Montague, J.; and Davis, P. (1999).*Ambient Noise Levels in University Classrooms: Detrimental to Teaching and Learning:*PerceptMot. Skills, Pp. *89*, 649-650.

Adrian, L.; and Bill, B. (1998). *Design for manageability in Sick Building Syndrome: Concepts, issues and practice:* E. and FN Spon, London. Pp. 135-150

Akande, T.M; and Owoyemi, J.O.(2008); *Awareness and Attitude to Social and Health Hazard from Generator use in Ayigba Nigeria.* Medwell Journal; *Research Journal of medical sciences* Vol. 2, No4 pp 185-189.

Andrew, S.; and Michael, P., (2009). Sustainable Workplaces: Improving Staff Health And Well-Being Using Plants". *Journal of Corporate Real Estate* Vol. 11 No. 1, pp. 52-63.

Barry P.H. (2008): "The Impact of Office Comfort on Productivity".*Journal of Facilities Management* Vol. 6 No. 1, Pp. 37-51.

Bhargawa, G. (2001).*Development of India's Urban and Regional Planning in 21st Century;* Gian Publishing House, New Delhi, Pp.115- 116.

Bluyssen, P.M. (2009). "Towards an Integrative Approach Of Improving Indoor Air Quality". *Building and Environment*. Vol. 44, Pp. 1980-1989.

Bond, M. (1996). Plagued by Noise. New Scientist, Pp.14-15 Business Line, New Delhi

David, L., (1998). Evaluating User Perception: Case Studies in Australia. *Facilities*. Vol.16 No. 5/6, pp. 138-142.

Edwin H.W., Chan E.A., (2008). Evaluation on Indoor Environment Quality of Dense Urban Residential Buildings. *Journal of Facilities Management*. Vol. 6 No. 4, pp. 245-265.

Ertugrul T., Ergin S.V., and Metin A., (2004): A Qualitative Study of Facilities and their Environmental Performance; *Management of Environmental Quality*. Vol. 15 No. 2, pp. 154-173.

James, R., (1994). Ergonomics in Academic Libraries, *Library*

Management, Vol. 15 No. 1, pp. 26-35.

Kiernan, V. (1997): Noise Pollution Robs Kids of Languages Skills. *New Scientist*. Pp. 5

Mark J.M., Terry B., Lee H., David J.O, Francis, J. O., Bradley, H.T., Kenneth M.W., Richard C.D., and William, J. F. (2006): "Causes and Prevention of Symptom Complaints in Office Buildings: Distilling the Experience of Indoor Environmental Quality Investigators". *Facilities*. Vol. 24 No. 11/12, pp. 436-444.

Morris A., and Dennison P., (2005): Sick Building Syndrome: Survey Findings of Libraries in Great Britain. *Library Management*, Vol. 16 No. 3, pp. 34-42.

Mudutgap, N. E. (2011): *Noise Level Characterization in Selected Libraries of Ahmadu Bello University Zaria*; unpublished B.Sc. Project report, Department of Building, Ahmadu Bello University Zaria, Kaduna.

Nelson, P.B., Soli, S. D. and Seltz, A. (2002): *Acoustical Barriers to Learning*; Acoustical Society of America: Melville, NY, USA.

Nyuk, H.W., and Wy, L.S.J., (2003). "Total Building Performance Evaluation of Academic Institutions in Singapore". *Building and Environment*. Vol. 38 Pp. 161-176.

Rao C.S. (2007). Environmental Pollution Control Engineering: New Age International Publishers Ltd., New Delhi; 2nd Edition.

Reginald, C., (2002). In Quest of an Ideal Library Environment: The Case of the Main Library, the University of West Indies, St. Augustine, Trinidad. *Library review*. Vol. 51 No. 6, pp. 287-292.

Rousseau, D., and Wesley, J., (1997): Healthy by Design; Building and Remodeling Solutions for Creating Healthy Homes, Hartley and Marks, Point Roberts.

Rowe, D.M., (1994): Sick Building Syndrome: The Mystery and the Reality; *Architectural Science Review*. Vol. 37 No. 3, pp. 137-147.

Sanjeev G., Mukesh K.; and Radha, G., (2007): Sick Building Syndrome: A Case Study in a Multistory Centrally Air-Conditioned Building in the Delhi City; *Building and Environment*. No. 42, pp. 2797-2809.

Thad, G., (1995): *Sick Buildings; Definition, Diagnosis and Mitigation*. CRC Press Inc. USA.

Vyla R., and Gill H.S., (1998): *Psychological Issues: a Multifaceted Problem, a Multidimensional Approach in Sick Building Syndrome: Concepts, Issues and Practice*. E. and FN Spon, London.

Zinbarg R., Yovel I., Revelle W., and McDonald R. (2006): Estimating Generalizability to a Universe of Indicators that all have an attribute in common: A Comparison of Estimators. *Applied Psychological Measurement. No.* 30, pp. 121-144.