NOISE EXPOSURE FROM PRIMARY AND SECONDARY SCHOOL STUDENTS: ACASE STUDY IN MALAYSIA

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Abstract

Noise exposure has negatively affected the school student and may be exposed to high noise levels during their daily study. This study aims to determine the internal sources of noise exposure in the school (objective 1), to calculate the daily noise exposure from primary and secondary schools in Malaysia (objective 2). A review of relevant literature obtained; this data set contained daily activities about noise exposure in the school and sound level in decibel. Daily noise exposure was calculated through the dose equation to get the students' permissible daily exposure. We found that occupied classrooms, canteen, school bell, schoolyard, and indoor sports are the primary sources (internal) of the noise in the school. Once data had been calculated, in Primary school, we found that on Wednesday the student's dose with extra-curriculum activities and the time-weighted average is above the action level 50% dose and 85 dBA, while the other days are normal. In both lower and secondary school noise exposure, the student's daily dose and the time-weighted average is less than action level. So in primary school, we need to reduce the noise at the source wherever possible and also carry out regular monitoring of the noise levels to ensure they have not increased.

Keywords: Noise; Primary; Secondary; Dose; TWA; Malaysia

1.0. Introduction

Noise, one of the most prevalent occupational toxic substances (Alberti, 2008), is responsible for 16 percent of all mortality and morbidity associated with the global burden of occupational diseases and injuries, according to the World Health Organization. Additionally, educational noise has been shown to be detrimental to the hearing organs of students and teachers (Nelson et al., 2005). Despite the established importance of noise exposure at school (Y. Avsar et al., 2005), the number of schools influenced by noise from various sources is unidentified, and there are moderately little data available on typical noise levels inside and outside schools (Shield, B., & Dockrell, J. E. 2010). Instances of inside noise sources in schools include classroom activities, indoor sports, and gymnasium, all of which are noisy. It has been estimated that as many as 500 million people globally may be at risk of acquiring hearing problems as a result of excessive noise exposure (Kreisman et al., 2010), and that excessive noise exposure is one of the most common causes of hearing disorders. Under the European Agency for Safety and Health at Work (2009), a safe and healthy school, which promotes a safe place for the students as well as their physical and mental well-being, is among the primary objectives of member countries of the EU. **Noise exposure is identified as the**

most common occupational danger by the World Health Organization [WHO] in their report Guidelines for Community Noise (WHO, 1999, p. 21). Having access to e-education is one of the most important opportunities a person can have during his or her life (Woolner et al., 2010). Overwhelming evidence that high levels of noise can lead to a poor learning environment, is not universally acknowledged in the educational community. Many studies have been carried out by research institutions on noise exposure in the school environment in recent years, demonstrating the significance of noise exposure in the school environment (Zulkepli & Richard, 2000).

In Malaysia, school children spend an average of five to seven hours every day at their various institutions (Ramli et al., 2012). Primary school children in Malaysia are between the ages of 6 and 12, according to their grade level, while secondary school students are between the ages of 12 and 17, based on their grade level (Nurul-Awanis, A.W., Hazlina, A. H., Yoke-May, L. Zariyawati, 2011). Noise sources at the school can be characterized as either external or internal, relying on where they originate (Karim, K, et al., 2020). Within the school (in surroundings adjacent to the classroom), noise is generated in areas such as the playground, recreational room, gymnasium, music room, cafeteria, and other classrooms, among many other places (Fernandez JC & Barreira CSC., 2015). Children, on the other hand, are subjected to a wide range of different sorts of noise while at school. Students' activities such as talking, roaming around the room, reading aloud, group work, the voices of teachers or students, and the operation of fans, ventilation, and air conditioning systems (HVAC) have all been shown to produce significant internal noise in schools, with the majority of it trying to come from their own activities (Trane, 2013). Noise is becoming a greater and greater source of concern in educational settings, when there is excessive noise in the classroom, the teacher must raise his or her voice more frequently (Buchari, 2017). High levels of noise in classrooms have a negative impact on children's learning and the well-being of teachers (Wall, 2015). It has also been reported that students' ability to hear and interpret speech has been diminished (Klatte et al., 2010), which may have an impact on their academic performance, reading ability (Hetu et al. 1990), long-term memory, and understanding. Children in primary school can hear and respond to their instructor in a slightly noisy atmosphere, according to research, but younger students (ages 6-7 years) have a harder time dealing than older children (ages 11-12 years) in a similar environment, according to research (Shield & Dockrel, 2014). The World Health Organization (WHO) suggests that the background sound level in school classrooms should not above 35 dB(A) during teaching sessions for students to be able to hear and interpret spoken messages. Additionally, the noise level on school playgrounds should not exceed 55 dB(A) (Berglund et al., 1999). Noise exposure has harmed the student's performance at school. In the duration of their everyday studies, the student may be exposed to a high level of noise for 5 or 6 hours per day, and they will be required to quantify the school's daily noise exposure. Following (Bulunuz et al., 2017), high-level noise in schools has an adverse effect on children's learning and teacher health, and students have a decreased ability to hear and understand voices, which can impair academic performance and reading ability, as well as long-term memory and cognitive task performance. The student's school performance has suffered as a result of his or her exposure to loud noises. Since children may be exposed to a high level of noise, it is vital to assess the school's daily noise exposure. Researchers discovered that excessive noise in schools had an influence on student development and school wellness and that pupils' capacity to hear and interpret speech had reduced as a result of the noise.

According to the objectives of this study, secondary data gathered from a review of the literature was used to identify internal sources of noise exposure in Primary and Secondary Schools in Malaysia. The second objective was to calculate the daily noise exposure levels in Malaysian primary and secondary schools.

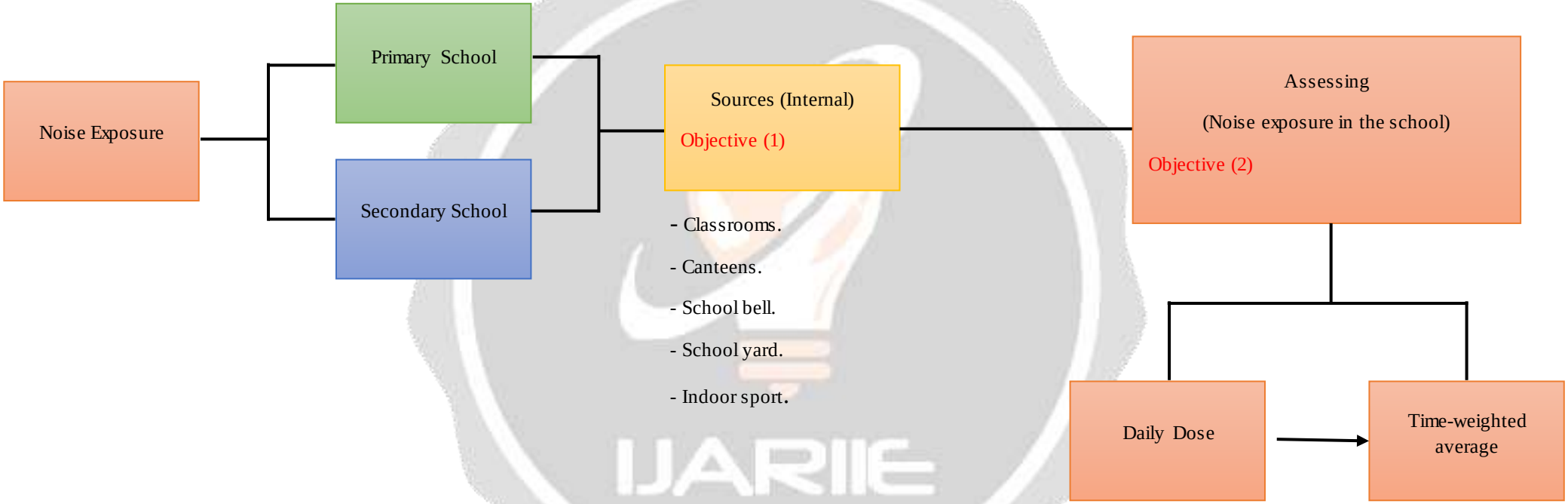

Figure (1): The study framework.

2.0. Methodology

The first objective can be achieved through obtaining secondary data from the literature review, this data set was contained daily activities about the internal source of noise exposure and sound level in primary and secondary schools in Malaysia. Primary school is normally from 7:30 a.m. to 12:20 p.m., for a total of four hours and fifty minutes per day. Each portion of the primary school classroom has two sections. To begin, classroom sessions typically consist of nine classes per day from Monday to Friday. Wednesdays are allocated for extra-curricular activities such as physical education and extra-curricular activities. Physical education programs will run one hour (1h) per week during the school day, while extra-curricular activities classes will only take thirty minutes (30m) per week. Primary students in levels 4,5, and 6 were only eligible to participate in extracurricular activities. These classes would be held in addition to regular classes. We were divided into two categories in secondary school: lower secondary school and upper secondary school. Students in lower secondary school attend ten lessons daily. In comparison, students in upper secondary school attend eleven classes per day, each class averaging 30 minutes and occurring Monday through Friday. Students in both lower secondary and upper secondary schools take 30 minutes of extracurricular activities class once a week. But from the other hand, physical education classes at the lower and upper secondary levels last around one and a half hours each week, respectively. all references to the Malaysian Ministry of Education are addressed (MOE).

Internal noise sources such as an occupied classroom, a canteen, a school bell, a schoolyard or playground, and indoor sports activities are the primary sources of noise in elementary school. The internal classroom's noise sources are caused by students' activities, such as speaking, movement around the classroom, reading aloud, collaboration exercises, and the usage of fans and ventilation. A canteen or cafeteria is a location where students, whether primary or secondary, can obtain meals while at school. Students are expected to spend at least 20 minutes every day in the canteen. Additionally, the school bell is one of the noisiest sources in the school, a daily exposure time is one minute. The schoolyard is the playground nearby to or surrounding a school where students frequently play games or group projects before boarding the school bus, daily time exposure is estimated to be five minutes. Indoor sports sources, extracurricular activities, and physical education classes are where students receive the majority of their daily noise exposure at school. These events are often held on Wednesdays.

The second objective can be achieved through calculation, Protocols used to compute the daily noise exposure to estimate for each subject were based on those previously described by the literature review. First daily exposure (routine) is calculated in this approach. Examples of activates that would be considered daily exposure in this approach include Occupied classrooms, student's activities or conversation, canteen, schoolyard, school bell, and gymnasium or indoor sports.

The representative sound level for each daily exposure activity queried was determined by a review of the available literature and summarized in Table 1.

$$D = \left(\frac{C}{T}\right) X\ 100$$

Here, C indicates to the total time of exposure at a specified noise level and T represented the exposure duration for which noise at this level becomes hazardous. It is calculated using the following equation, L represented the values listed in table 1 that represented sound level of each noise activities in primary and secondary school.

The rise in decibels that causes the maximum exposure period to be cut in half. An increment in noise level of 3 dB results in a doubling of energy (for instance, a noise level of 85 dB has half as much energy as a noise level of 88 dB). For various standards, a 3 dB exchange rate is employed, and Leq uses this rate. The rate of exchange, on the other hand, isn't a value that everyone agrees on. The exchange rate that should be used when measuring noise dose will be specified by each standard, regulation, or directive.

The exchange rate, for contrast, is established at 5 dB in OSHA rules. So, according to OSHA Hearing Conservation requirements, a student can be exposed to 85 dB for 7 or 8 hours, but if the sound level is increased to 90 dB, the permitted exposure time is cut in half to four hours.

$$\mathrm{T} = \frac{8}{2\left(\frac{\mathrm{L}-85}{5}\right)}$$

Dose is a measure of noise exposure and is directly related to Lex, this total dose, D, is subsequently used in the above equation to calculate annual noise exposure. OSHA action level is based on either TWA or Dose %

(which are a different representation of the same number) these action level is 85dB or (50%) dose and 90dB (100%) dose.

The daily dose can be converted into an 8-hr TWA according to the following formula:

$$TWA = 10 \times Log(D\backslash 100) + 85$$

When the amount and period of exposure to a thing differ, the time weighted average for exposure to that thing can be applied. It can also be used for short-term data, as a 15-minute TWA. Time-weighted average takes into account specific aspects such as dose rate and period. TWA is for time-weighted average sound level, and D stands for amount proportional in the current effect.

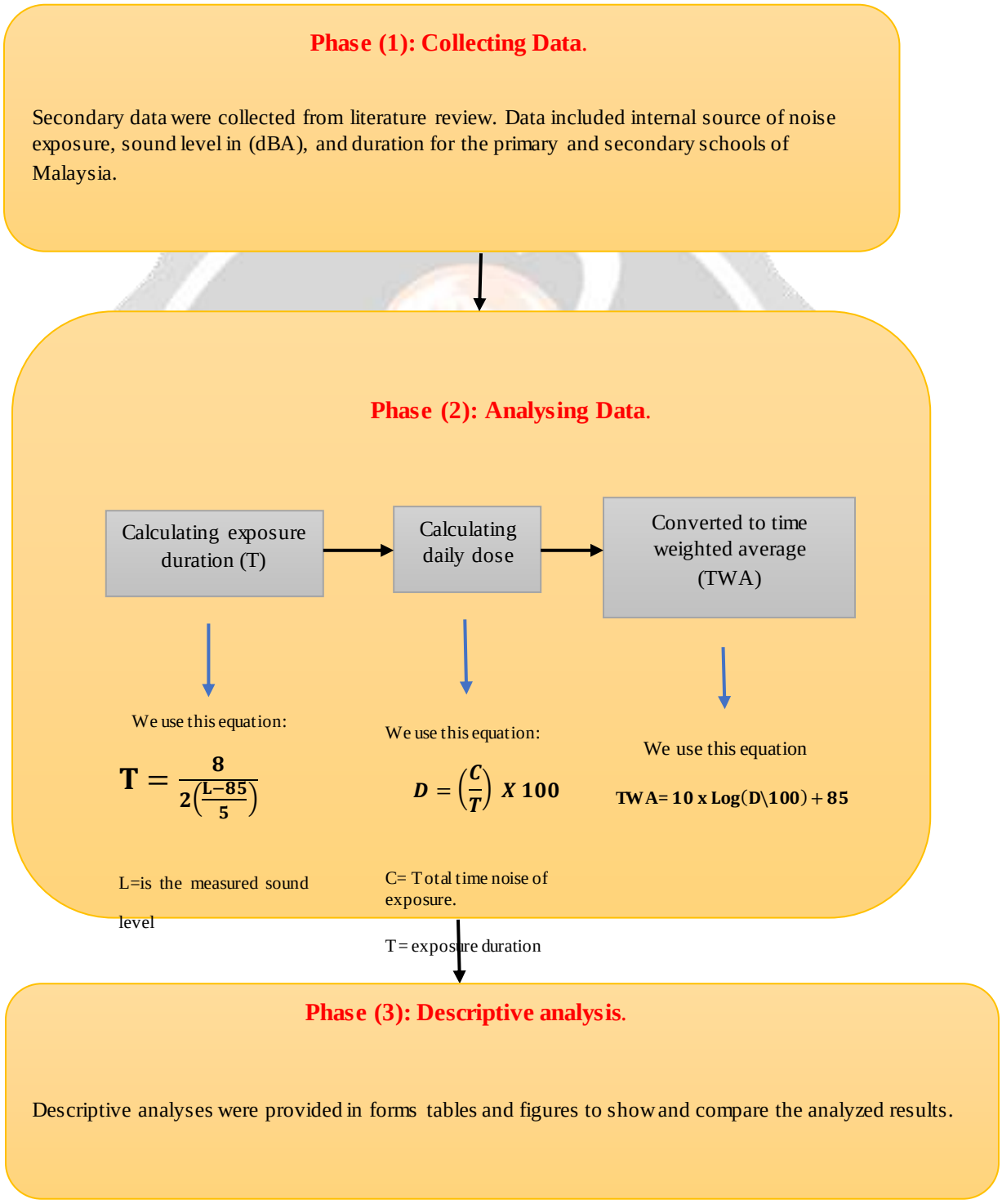

Figure (2): The methodology flowchart.

3.0. Results

Table 1 was shown that the first objective results described the internal noise sources and sound level determined by a literature analysis for various noise-related activities, most notably for internal noise sources in primary and secondary schools. The primary and secondary school's highest decibel level of noise exposure comes from the school bell, 105dBA. The second highest decibel sound level of school noise exposure occurs in the canteen, with 101dBA for primary schools and 96dBA for secondary schools. While the school playground or schoolyard has the third-highest decibel sound level at 97 dBA and 95 dBA for primary and secondary school, indoor sports for primary school have a decibel sound level of 94.4 dBA and 90 dBA for secondary school. Finally, the classroom has a decibel sound level of 75 dBA and 72 dBA for primary and secondary school, respectively. These are the most influential noises emanating from the school's internal source.

Table (1). Sound level obtained from literature review for various activities on noise exposure from primary and secondary schools.

Noise Activities Categories	Representatives L_{Aeq}(dBA) Levels from literature		Time Exposure	References
	Primary	Secondary		
Classroom	**75 dBA**	**72 Dba**		Ismail, Karim, Khairani, Othman, N. A. (n.d.). *Noise Levels in Malaysia Primary Schools: Are We Meeting the International Standards?* Sato H, Bradlev JS. Evaluation of acoustical conditions for speech communication in working elementary school classrooms. J Acoustic Soc Am. 2008;123(4):2064-77. Article, 2014 . Measurig noise in classrooms: a systematic review.
School bell	**105 dBA**	**105 dBA**		García et al., 2019 Bulunuz, N., Orbak, A. Y., Mulu, N., & Tav, F. (2017). *An Evaluation of Primary School Stud ents ' Views about Noise Levels in School* *. 9(June), 725–740. WHO. (1999). 4 . Guideline Values. *Guidelines for Community Noise*, 55–65. http://www.who.int/docstore/peh/noise/guidelines2.html.
Canteen	**101 dBA**	**96 dBA**		P. G. Pinho., et al. 2018). Aspects of concern the acoustical performances of school cafeteria. Chen, L., & Scott, E. B. (2012). *Noise Evaluation of Elementary and High School Music Classes and Indoor Marching Band Rehearsals.* Accoustical Solutions, Inc.: (2010) "Restaurant and Dining." [Online] Available at http://www.acousticalsolutions.com/restaurant-dining/start 1.
Schoolyard	**97 dBA**	**95 dBA**		Burgess, M. (2015). *THE COMBINATION OF WORKPLACE AND. March.* Chen, L., & Scott, E. B. (2012). *Noise Evaluation of Elementary and High School Music Classes and Indoor Marching Band Rehearsals - Alabama. May*, 1–20.
Indoor Sports	**94.4 dBA**	**90 dBA**		Bulunuz, N., Orbak, A. Y., Mulu, N., & Tav, F. (2017). *An Evaluation of Primary School Stud ents ' Views about Noise Levels in School* *. Jonsdottir (2009). Connection between unfavorable acoustics in sports halls and high prevalence of voice problems in sport teachers. Proc Euro noise, Edinburg.

The second objective was determined for primary and secondary school calculation for daily noise and time-weighted average. Table 2 shows the results of daily dose and the time-weighted average for noise exposure. The data was obtained from a literature review, which proved to be the most internal source of the school; therefore, the results described indoor sports and the canteen are the most daily dose and the time-weighted average for noise exposure; therefore. There are four hours and fifty-six minutes of total time exposure for daily school on Monday through Friday. With an additional hour and it would come five hours and fifty-six minutes of exposure on Wednesday due to the extra class on Wednesday. Moreover, the daily noise dose is 30.5% and 81.5 dBA, while the Wednesday noise dose is 52.8% and 85.4 dBA. Overall noise dose for a day in primary school is 52.8 percent, although the time-weighted average is 85.4 dBA. that means the primary school dose are above the action level.

Table (2). Daily noise exposure for Primary School

Noise Sources		Noise Level (dBA)	Time Exposure (Hrs.)	Daily Dose %	TWA
Classes		75dBA	4h 30m	**7.0 %**	**70.8 dBA**
Canteen		101dBA	20m	**19.1 %**	**78.1 dBA**
School bell		105dBA	1m	**1.7 %**	**60.5 dBA**
Schoolyard		97dBA	5m	**2.7 %**	**64.1 dBA**
Total			**4h 56m**	**30.5%**	**81.5dBA**
Indoor Sports	**Only for Wednesday**	94.4dBA	1h	**23.0 %**	**79.4dBA**
	Total		**5h 26m**	**52.8%**	**85.4dBA**

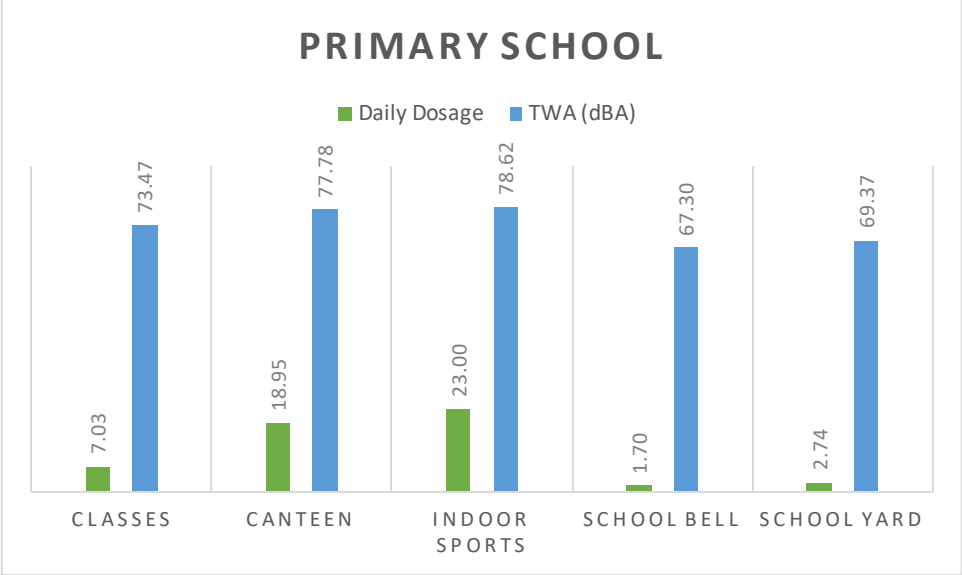

Figure (3). Daily noise exposure and TWA in primary school.

The findings of the daily dose and the time-weighted average for lower secondary school are shown in Table 3. Indoor sports have the highest daily noise dose at around 18.8% and 77.9 dBA on a time-weighted average, while canteens have the second-highest daily noise dose at 9.6% and 73.1 dBA on a time-weighted average. By comparison, the classroom represents 5.2 percent of the dose and 68.6 dBA on a time-weighted estimate based. The total time exposure for daily school is five hours and twenty-six minutes; however, Wednesday will include additional classes, increasing the total time exposure to six hours and fifty-six minutes. As a result, the overall daily noise dose in lower secondary school is 36.7 percent, whereas the time-weighted average is 82.8dBA, that means the daily dose and TWA are below the action level.

Table (3). Daily noise exposure for Lower Secondary School

Noise Sources	Noise Level (dBA)	Time Exposure	Daily Dose %	TWA
Classes	72dBA	5h	**5.2 %**	**68.6 dBA**
Canteen	96dBA	20m	**9.6 %**	**73.1 dBA**
School bell	105dBA	1m	**1.7 %**	**60.5 dBA**
Schoolyard	95dBA	5m	**2.1 %**	**62.1 dBA**
Total		**5h 26m**	**18.5%**	**77.8dBA**

Indoor Sports	**Only for Wednesday**	90dBA	1h 30m	**18.8%**	**77.9dBA**
	Total		**6h 26m**	**36.7% %**	**82.8dBA**

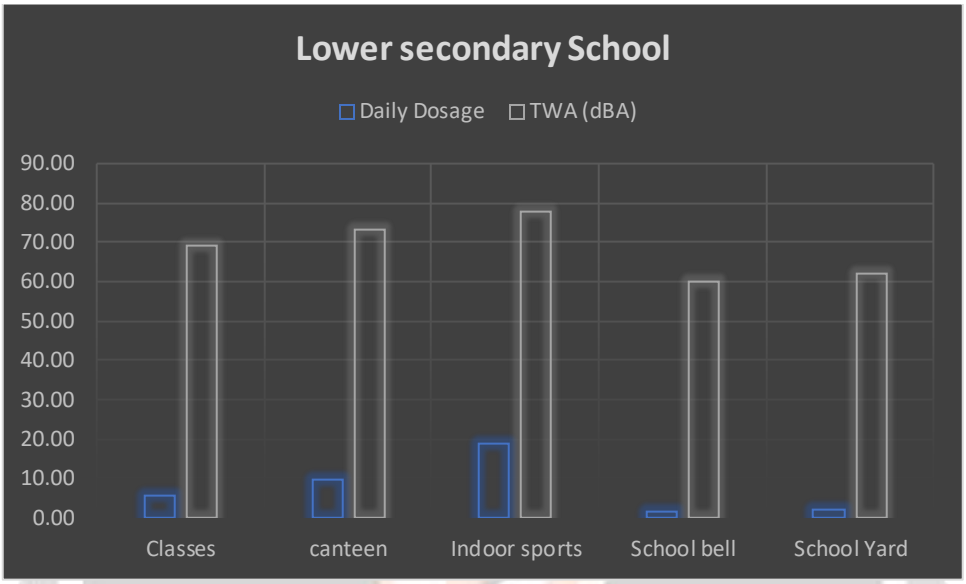

Figure (4). Daily noise exposure and TWA on lower secondary school.

Results of the daily dose and time-weighted average for upper secondary school are shown in Table 4. According to the findings, indoor sports responsible for almost 18.8 percent of daily noise dose and 77.9 decibels for the time-weighted average, the canteen accounts for 9.6 percent of daily noise dose and 73.1 decibels for the time-weighted average, and the classroom reports for 5.7 percent of daily noise dose and 69.3 decibels for the time-weighted average. Furthermore, the overall time exposure for every day of school is five hours and fifty-six minutes, whereas Wednesday has extra lessons, resulting in a total time exposure of seven hours and twenty-six minutes on Wednesday. For upper secondary school students, therefore, the overall daily dose of noise exposure is 37.2 percent, whereas the time-weighted average was 82.9 decibels.

Table (4). Daily noise exposure for Upper Secondary School

Noise Sources	Noise Level (dBA)	Time Exposure	Daily Dose %	TWA
Classes	72dBA	5h 30m	**5.7 %**	**69.3 dBA**
Canteen	96dBA	20m	**9.6 %**	**73.1 dBA**
School bell	105dBA	1m	**1.7 %**	**60.5 dBA**

Schoolyard		95dBA	5m	**2.1 %**	**62.1 dBA**
Total			**5h 56m**	**19.0%**	**78 dBA**
Indoor Sports	**Only for Wednesday**	90dBA	1h 30m	**18.8 %**	**77.9**
	Total		**6h 56m**	**37.7%**	**83dBA**

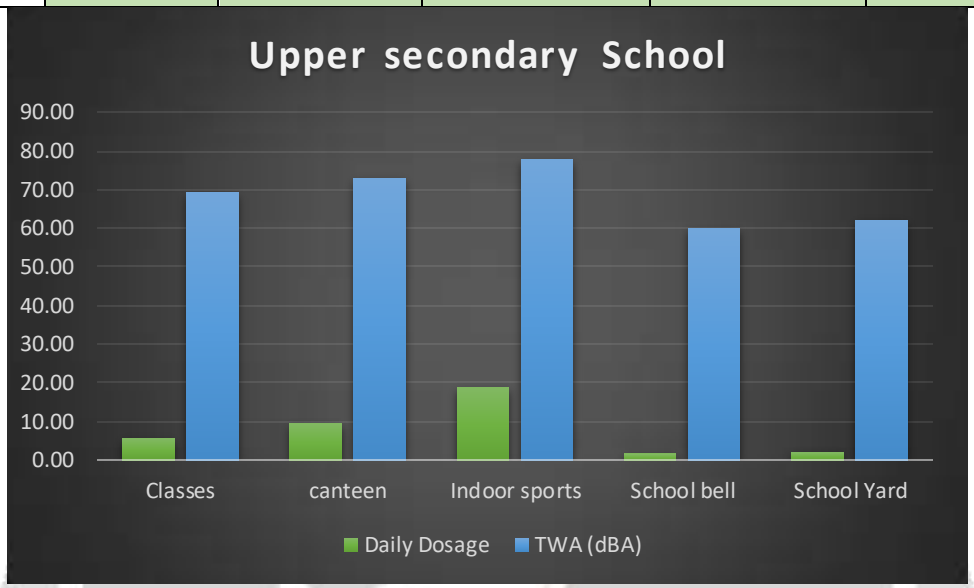

Figure (5). Daily noise exposure and TWA for Upper secondary school.

4.0. Discussion

The first objective was discussed among internal noise sources and time exposure for the school day in primary and secondary. As reported by (ASHA, 2015) found that high noise in schools has a bad effect on student development as well as educator wellbeing. As a result of excessive levels of noise, pupils' capacity to understand and recognize voices is considerably weakened, which can have negative consequences for student success and reading ability, as well as long-term memory and attention achievement motivation and retention. The students at the local public school appear to have suffered as a result of their exposure to excessive noise. Throughout their ordinary studies, students may be subjected to a high level of noise for five or six hours per day, and they will be expected to quantify the amount of noise they are exposed to daily at the School. It has already exceeded the Malaysian legal sound level (LAeq) for schools, as well as international standards for noise pollution, according to the Malaysian government.

The primary school typically begins at 7:30 a.m. and ends at 12:20 p.m., for a total of 4 hours and 50 minutes per day. Each section of the primary school classroom is subdivided into two sections. First the session inside the classroom are typically nine classes each day and 45 classes per week from Monday to Friday, on average. Extra-curricular activities such as physical education and extra-curricular activities are offered on Wednesdays . During the school day, physical education sessions will last one hour (1h) per week, while extra-curricular activities classes will last thirty minutes (30m) per week. Students in grades 4,5, and 6 are only allowed to attend the extra-curricular activities programs. These sessions will be held separately from everyday classes. For my case, these classes will be used to account for activities that take place outside of the classroom or indoor sports activities. During the extra-curriculum activity and physical education day, the student has higher dose because they spent more time at indoor sports this case has been shown in results by (ASHA, 2015)

In secondary school, we are divided into two categories: lower secondary school and upper secondary school. In lower secondary school, students take ten (10) classes per day. In contrast, in upper secondary school,

students take eleven (11) classes per day, with each class enduring 30 minutes in duration and attending from Monday to Friday. Students in both lower secondary and higher secondary schools get 30 minutes for extra-curricular activities class once a week in extra-curricular activities class. On the other hand, physical education programs are just 2 hours and 1.5 hours each week on the lower and upper secondary levels, respectively. Unless otherwise specified, all information referred to Malaysia's ministry of education (MOE).

Student experience of noise varies greatly depending on the environment they are in during their school day. The most major noise sources in elementary school come from internal sources such as an occupied classroom, a canteen, a school bell, a schoolyard or playground, and indoor sporting activities. Following Article 2014, noise is produced within the school's internal sources (in surroundings next to the classroom), such as the schoolyard, recreation room, gymnasium, music room, kitchen, and other classrooms, among others. A standard primary school classroom has noise levels of 65 decibels dB or more, which means that children are exposed to the noise of their classmates talking, which is known as "classroom babble" for much of the day (A). Classes take up the majority of their time, which is approximately 4 hours and 30 minutes. By (shield and Dockrell, 2004), the noise sources in the internal classroom are generated by students' activities at the school, including speaking, walking around the classroom, reading aloud, teamwork activities, and the use of fans, ventilation, and an air conditioning system (HVAC). According to the other study, the size and shape of the classroom, the location, and construction of the ceiling and walls, as well as the number of sound sources, the type of sound sources, and their locations, as well as the strength of the sound produced, could all have an impact on the level of noise in the classroom (Ibrahim et al. l., 2000). The WHO norm for classroom noise levels is 55 decibels (dB), and so far, the majority of noise levels in classrooms have been higher than that standard (A).

A canteen is a place where students can get meals while attending school, whether primary or secondary. It is estimated that Malaysian students spend at least 20 minutes every day in the canteen, with the noise level in the canteen averaging around 97 to 101 decibels. Malaysia is affected by excessive noise, and students are particularly sensitive since they have limited ability to influence the noise levels in their surroundings, which makes them particularly exposed. According to another survey, the average sound level in the canteens is 97 decibels. When it comes to sound insulation, this means that it is approximately four times louder than the standard SIA 181 suggested for canteen construction (Braun et al., 2011). The school bell is also one of the most noise-producing sources in the school, with a decibel level of 105 dBA and duration of exposure of one minute per day; in addition, the number of times the school bell is used is 12 times per day, and it is used to announce critical times to students and staff, such as the beginning and end of the school day, classes, and breaks. There are certain schools where a bell is a physical object operated by electricity, which is the case. The schoolyard is the playground adjacent to or around a school where students often play games or finish their classes before boarding the school bus. The estimated time exposure is five minutes per day, and the noise level of the schoolyard is 97 decibels. On the other hand, according to a study conducted by Polish and Iranian researchers, the noise from the schoolyard and corridors has a substantial impact on learning. (Augusta and colleagues, 2010) During these indoor sports activities, students participate in extracurricular activities and physical education classes, and it is also during these activities that students receive the majority of their daily noise exposure in school. These activities are usually held on Wednesday, and the average noise level is 90 to 94.4 dBA.

The second objective determined the equation that we use for the calculation of daily and TWA for primary and secondary schools. The dose is an individual's entire time-weighted average sound exposure throughout an eight-hour workday. This is represented as a percentage of the maximum permissible sound exposure. If the individual is subjected to varying noise levels throughout the day, it is convenient to quantify the noise dose using a noise dosimeter. Without a dosimeter, calculating the overall noise dose for various noise levels can become complex, as decibel values cannot be averaged. (Noise levels are expressed in logarithms.) The permissible noise dose is not universally accepted. Measuring students' noise exposure is a critical component of a workplace hearing conservation and noise management program. It assists in identifying sources of noise, children who may be exposed to levels of noise that can cause hearing loss, and locations where additional noise measurements should be taken. Additionally, this information assists in determining the suitable noise reduction measures that should be implemented.

When the concentration and time of exposure to a chemical varies, the time-weighted average (TWA) for noise exposure to that material may be utilized. It is also applicable to samples taken over a short period, such as a 15-minute TWA. TWA takes into account specific variables, such as dose rate and duration. For instance, imagine a student is exposed to various chemical sources at varying doses and durations. In that instance, we can use TWA to ascertain the student's average exposure to that source. In the calculation, I referred to OSHA, which establishes legal limitations on workplace noise exposure. These restrictions are calculated using the time-weighted average of a worker's hours worked throughout an eight-hour day. OSHA's permissible exposure limit (PEL) for noise is 90 decibels (dBA) for all workers throughout an eight-hour day.

The noise regulations are part of the 1974 Health and Safety at Work Legislation, which is based on European legislation. It is legally enforceable, and one of those EU's 28 member states is required to adopt it into their state legislation. Before you can use the noise exposure calculation, you must first choose the appropriate rules for your location. The majority of OSHA and ISO standards are in use around the world, notably in the United States, Canada, the United Kingdom, and Europe. Noise standards (such as OSHA, MSHA, ACGIH, and others) use the Time Weighted Average, or percent Dose, to determine activity levels, but European and UK regulations use daily noise exposure, or LEP, d. These estimates are based on a student's daily noise exposure rather than mere snapshots of the noise level. A Noise Dosimeter, such as the dose Badge, can be maintained during the working day to evaluate the students' noise exposure.

An action level is a noise exposure level over which students must take particular steps to mitigate the adverse effects of noise on hearing. Continuous noise has two primary action levels: 80 decibels and 85 decibels. The criterion level is the decibel level of a sound that, if applied continuously for the required period, will produce a dose of 100%. The criterion level varies depending on the standard. The current OSHA criteria level, for example, is 90 decibels. NIOSH's current criteria level is 85 decibels. The exchange rate is the number of decibels that causes the maximum exposure time to be halved. An increase in the noise level of 3 decibels results in a halving of energy (for instance, a noise level of 85 dB has half as much energy as a noise level of 88 dB). The OSHA regulations, the exchange rate is regulated 5 dB So, when looking at OSHA Hearing Conservation regulations, children might be exposed to 85 dB for 5 or 6 hours, but when the sound level is increased to 90 dB, the allowable exposure time is halved to 4 hours.

5.0. Conclusion

The study indicated that the daily noise exposure and time-weighted average from primary and secondary school in Malaysia. The most common internal noise sources of primary and secondary schools were classroom activities, canteen, school bell, schoolyard, and indoor sports. The high level of noise in indoor sports was related to the extra-curriculum activities and physical education class with almost 52.8% for dose and 85.4 dBA for TWA, while daily dose and TWA are above the action level. The study's limitations have included the fact that it focused primarily on internal noise sources and levels in Malaysian primary and secondary schools. The data was gathered through a review of the literature, and the calculations were carried out with the help of Microsoft Excel 365. By recommending in the future that noise be reduced at sources wherever possible, students are educated about hearing problems, and noise levels are evaluated regularly to ensure they have not increased. It is hoped that this study would be part of an effort to improve indoor sports classless in Malaysia. The goal of establishing an adequate and sustainable environment for children to learn effectively has been realized.

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