

CLASSROOM-BASED EDUCATIONAL HEARING CONSERVATION PROGRAMME: ADDRESSING THE CONTENTS AND CHALLENGES

NORAIDAH ISMAIL (CORRESPONDING AUTHOR)
DEPARTMENT OF AUDIOLOGY AND SPEECH SCIENCES,
KULLLIYAH OF ALLIED HEALTH SCIENCES,
INTERNATIONAL ISLAMIC UNIVERSITY OF MALAYSIA,
25200 KUANTAN, PAHANG, MALAYSIA
noraidah@iium.edu.my

KAMARUL AKMAL ISHAK
DEPARTMENT OF AUDIOLOGY AND SPEECH SCIENCES,
KULLLIYAH OF ALLIED HEALTH SCIENCES,
INTERNATIONAL ISLAMIC UNIVERSITY OF MALAYSIA,
25200 KUANTAN, PAHANG, MALAYSIA
marul_ukm@yahoo.com.my

SARAH RAHMAT
DEPARTMENT OF AUDIOLOGY AND SPEECH SCIENCES,
KULLLIYAH OF ALLIED HEALTH SCIENCES,
INTERNATIONAL ISLAMIC UNIVERSITY OF MALAYSIA,
25200 KUANTAN, PAHANG.
sarahrahmat@iium.edu.my

ABSTRACT

Nowadays, leisure noise exposure has become a public health concern. Young adults are often exposed to a high level of noise, particularly from leisure and recreational activities. To improve the youths' decision-making towards noise exposure, noise experts recommend the implementation of a hearing health promotion programme at schools, also known as the classroom-based Educational hearing conservation programme (EdHCP). Implementation of the EdHCP is proven to improve youths' attitudes, knowledge, and behaviours towards leisure noise exposure. However, a formal EdHCP targeting high school or university students has yet to be developed in Malaysia. This paper aims to review the contents of existing classroom-based EdHCP from other countries and to identify the challenges faced in ensuring the programmes' sustainability. Four classroom-based EdHCPs targeting school children and students were identified; i) Dangerous Decibels®, ii) Hear4Tomorrow (H4T), iii) It's a Noisy Planet. Protect Their Hearing®, and iv) Cheers for Ears. Their objectives, targeted participants, learning modules, materials, activities, and time frame were reviewed and analysed. The obstacles faced during these programmes' implementations and recommendations raised by experts for programme sustainability were also evaluated. Generally, the reviewed programmes had a similar goal that is to minimise noise-induced hearing loss (NIHL) among school children and students. Even though most of the reviewed programmes were specified for school children, the information obtained would serve as a guide and provide references to determine essential contents that should be included for the development of a Malay EdHCP targeting students in high schools, colleges, and universities in Malaysia. Nevertheless, the common issues for programme sustainability should be prioritised and considered.

KEYWORDS: Educational, Leisure noise, Children, Adolescent, School.

INTRODUCTION

The exposure to leisure and recreational noise activities among young adults or youth has become a public health concern worldwide. In 2015, the World Health Organisation (WHO) mentioned that approximately 1.1 million children and young adults were at risk of developing noise-induced hearing loss (NIHL) due to poor listening practices and engagement in noisy related activities. Youths frequently participate in leisure activities with high levels of noise, such as attending concerts, using personal listening devices (PLDs), attending sporting events, singing in karaoke, going to cinemas, and playing musical instruments, which put them at risk of having NIHL (Zhao et al., 2010; Beach et al., 2014; Carter et al., 2014; Jiang et al., 2016).

NIHL is an irreversible but fully preventable hearing loss. This type of hearing loss is caused by damaged outer hair cells due to excessive noise exposure. Typically, NIHL is insidious, but with prolonged exposure, it will affect communicative ability and reduce cognitive performance among children and students (Stansfeld & Clark, 2015; Su et al., 2020). Later on, this condition could lead to a negative impact on both individuals and countries (Brown et al., 2018). Huddle, et al. (2017) estimated that hearing loss caused a loss of billions of dollars per year worldwide, including medical expenditures, loss of income and productivity, and caregiver costs.

Several factors contribute to the listening attitude and behaviours among the youth. The factors include psychosocial differences such as age, gender, race and education (Widén et al., 2006; Chesky et al., 2009; Lee et al., 2014; Balanay & Kearney, 2015; Warner-Czyz & Cain, 2016). A local study conducted among university students in Malaysia showed that the majority of students had poor knowledge and attitude towards noise (Hamzah et al., 2019). The findings highlighted the importance of providing substantial education to improve the youths' attitudes, knowledge, and behaviours towards noise.

In the United States, the Healthy People 2020 issued a campaign on hearing protection device (HPD) usage and awareness on NIHL among children and young adults (ODPHP, 2018). The campaign promoted HPD usage and endorsed precautionary measures such as walking away from sound sources and turning down volumes. Following these recommendations, numerous classroom-based educational hearing conservation programmes (EdHCP) targeting school children and high school students were developed worldwide, to convey the message of the effects of high noise exposure to children. They were also taught on how to take care of their ears.

The primary goal of an EdHCP is to educate school children and students about the impact of hearing loss and to teach preventive measures. According to Rawool (2012), the core objective of an EdHCP is to protect students from loud noise and to encourage them to instil healthy listening practices at a younger age for better future applications. Previous findings have shown that classroom-based EdHCP was effective in improving attitudes and knowledge as well as promoting healthy hearing behaviours among school children and students (Chermak & Peters-McCarthy, 1991; Dell & Holmes, 2012; Gilles & Paul, 2014; Keppler et al., 2015; Khan et al., 2018).

Nevertheless, a formal EdHCP focusing on high school and university students has yet to be developed in Malaysia. No standard module has been developed from either the Ministry of Education or the Ministry of Health for teachers or school nurses to convey information on noise exposure and hearing loss. Therefore, the present study aimed to review learning modules, contents, and materials of existing classroom-based EdHCP developed in other countries. This was done in order to seek insights in relevant topics for the future development of a Malay EdHCP, targeting high school and university students in Malaysia. The obstacles faced in these programmes and the recommendations raised by noise experts for the programmes' sustainability are discussed.

All related studies were identified by searching electronic databases in PubMed, Google search, Science Direct, and Web of Knowledge. Search keywords included 'school-based hearing conservation

programme,' 'hearing conservation programme for youth,' 'classroom-based hearing conservation module,' and 'contents of hearing conservation programme'. The reference list of each study was checked to find other relevant articles.

IDENTIFYING THE EXISTING CLASSROOM-BASED EdHCP IN SCHOOL

The English classroom-based EdHCPs conducted in other countries (USA and Australia) were reviewed. Based on the accessibility, objectives, and intervention approaches, only four classroom programmes were selected; i) Dangerous Decibels®, ii) Hear4Tomorrow (H4T), iii) It's a Noisy Planet. Protect Their Hearing®, and iv) Cheers for Ears. These were chosen as they provided a full description of their classroom-based programmes. The selected programmes were reviewed in terms of the learning modules, contents, activity materials, and timeframe. The descriptions of the reviewed programmes are summarised in Table 1.

Dangerous Decibels®

Dangerous Decibels® was developed through the collaborative efforts of three organisations: i) the Oregon Museum of Science and Industry (OMSI), ii) the Oregon Hearing Research Center, and iii) the Oregon Health and Science University. The Portland, USA-based programme was launched in 1999. The objective of Dangerous Decibels® is to prevent NIHL and tinnitus among children and teenagers between 5 to 17 years old. It is recognised as a well-balanced programme that uses science and facts to deliver its messages.

The Dangerous Decibels® contains four learning resources: i) Dangerous Decibels® exhibition programme, ii) virtual online exhibition, iii) classroom-based programme, and iv) training for the trainees. The 50-minute interactive classroom programme addresses 5 learning modules; i) Physics of sound, ii) Normal hearing mechanisms, iii) How noise can damage hearing, iv) Effects of hearing loss, and v) Hearing loss prevention strategies. Three hearing loss precaution strategies are introduced to students including; 1) walking away from noise sources, 2) turning it down, and 3) wearing HPD (Meinke et al., 2008).

The uniqueness of the Dangerous Decibels® is the presence of a mannequin named Jolene in classroom activities. The mannequin is operated by inserting a headphone into its ears. To attract the students, the mannequin will then read the decibel level of the music being played from a personal listening device through an attached sound level meter. Dangerous Decibels® also conducts training workshops for those interested in becoming a certified Dangerous Decibels® educator. The educator teaching modules in the form of educator kits can be purchased from their official website at <http://www.dangerousdecibels.org>. Online activities and interactive educational games for children are included in their website.

It's a Noisy Planet. Protect Their Hearing®

Another programme developed in the United States is called "It's a Noisy Planet. Protect Their Hearing®". The programme was launched in October 2008 and was initiated by the National Institute of Deafness and other Communication Disorders (NIDCD), in collaboration with the Dangerous Decibels® team members. The main objective of this programme is to prevent NIHL among American primary school children between 8 to 12 years old.

The 45-minute classroom-based programme includes 5 learning modules; i) What is sound, ii) How do we hear, iii) How does sound damage our ear, iv) How loud is too loud, and v) Protecting our hearing. Similar to the Dangerous Decibels®, the 3 hearing precaution measures (walk away, turn it down, and wearing HPD) are introduced to the students as key messages. The materials in the form of fact sheets, shareable images, infographics, posters, and bookmarks in English and Spanish can be

freely downloaded or ordered through their official website at <http://www.noiseplanet.nidcd.nih.gov/>.

The uniqueness of this programme is the involvement of parents as role models for their children at home (Figg, 2018). The website provides parents with tips on helping and encouraging their children to protect and take care of their ears. Online activities and interactive educational games are incorporated into the website to make it more interactive.

Hear4Tomorrow (H4T)

The Hear4Tomorrow (H4T) is a classroom-based program that was designed to educate and to prevent the occurrence of NIHL among Australian children between 5 to 12 years old (Addison & Gilliver, 2012). The program was developed by the National Acoustic Laboratory (NAL). The contents and some of the materials were adapted from the Dangerous Decibels®.

The final version of H4T was launched in November 2012, consisting of 4 modules; i) Understanding hearing loss, ii) Hearing system and noise, iii) How loud is too loud, and iv) Protecting our ears. The contents of the H4T were adapted from the Dangerous Decibels®, which emphasised on 3 hearing precaution measures (walk away, turn it down, and wearing HPD).

A video on hearing loss simulation and educational flashcards are provided as a supplement to ensure that students could recognise dangerous noise and comprehend the impact of hearing loss in their daily lives. The programme outline, supporting information, and other resources are available and can be freely downloaded by any interested parties from the H4T official website at <https://hear4tomorrow.nal.gov.au/links.html>.

Cheers for Ears

Another educational program was introduced in Australia in May 2010 by the Ear Science Institute Australia (ESIA). The program is called "Cheers for Ears", and it addresses the problem of poor listening practices of personal listening devices among children. The programme was designed to educate children from Western Australia aged between 5 to 7 years old. The program consists of 5 learning modules; i) Hearing loss, noise, and sound, ii) Auditory pathway, iii) Hearing loss simulation, iv) Personal listening device, and v) Noise awareness with a duration of 60 minutes (Taljaard et al., 2013).

The uniqueness of Cheers for Ears is the use of a Sound level meter (SLM) application called 'Safe&Sound', which was developed on the Android platform. The Safe&Sound app can monitor sound level from any PLD attached to the user and calculate their daily noise dose level. An online computer game named 'Epic Ear Defense' was developed and it allows children to learn how to protect their hearing from noise in a fun way. A mascot named Charlie is introduced during the programme. Charlie is a superhero wearing an earmuff to encourage the children to wear hearing protection gear.

Activity sheets, wristbands, stickers, and bags displaying the Cheer for Ears logo are provided to the children. These takeaway kits not only serve as a reminder for the students, but they can also be shared with their parents, siblings, and friends. Similar to Dangerous Decibels®, the Cheers for Ears also has their own mannequin named Safe Hearing Suzie, which is attached with a sound level simulator.

Table 1 Description of the goal, target population, modules, materials, and duration of the reviewed EdHCPs

Programme	Dangerous Decibels®	Hear4Tomorrow (H4T)	Cheers for Ears	It's a Noisy Planet. Protect their hearing®
Goal	To prevent NIHL and tinnitus for primary and high school students	To increase knowledge about noise and NIHL for primary school children	To increase knowledge of leisure noise exposure particularly on the use of PLD	To increase awareness of NIHL and prevention measures
Target population	Children and students between 5 and 17 years old	Children and students between 5 and 12 years old	Children and students between 9 and 13 years old	Children and students between 8 and 12 years old
Module	<ol style="list-style-type: none"> 1) Physics of sound 2) Normal hearing mechanisms 3) How noise can damage hearing 4) Effects of hearing loss 5) Hearing loss prevention strategies 	<ol style="list-style-type: none"> 1) Understanding hearing loss 2) Hearing system and noise 3) How loud is too loud 4) Protecting our hearing 	<ol style="list-style-type: none"> 1) Hearing loss, noise, and sound 2) Auditory pathway 3) Hearing loss simulation 4) Personal listening device 5) Noise awareness 	<ol style="list-style-type: none"> 1) What is sound 2) How do we hear 3) How does sound damage our hearing 4) How loud is too loud 5) Protecting our hearing
Materials	Classroom activity Museum exhibition Virtual exhibition Jolene: a mannequin with a sound level meter Official website	Classroom activity Educational video Online hearing loss simulation Official website	Classroom activity Educational video Games & quizzes Smartphone application Charlie: a mascot Suzie: a mannequin with a sound level meter Official website	Classroom activity Educational video Infographics Online hearing loss simulation Official website
Duration	50 minutes	60 minutes	60 minutes	45 minutes

LEARNING MODULES FOR THE CLASSROOM-BASED EdHCP IN SCHOOLS

A classroom-based educational hearing conservation programme should contain a specific module to cater to the target group. From the analysis performed, it can be concluded that all the programmes' contents and learning modules are similar.

Many of these modules were related to the core elements of NIHL prevention programmes recommended by Roger, et al. (2009), Lass, et al. (1987a) & Anderson (1991). Roger, et al. (2009), suggested that all learning modules for a classroom-based EdHCP should include; i) Characteristics and source of noise, ii) Anatomy and normal mechanism of hearing, iii) Impacts of noise on the auditory system, iv) Symptoms related to NIHL, and v) Hearing preventive measures. Lass, et al. (1987a) recommended the inclusion of some topics in the learning instructions, such as hearing mechanisms, the cause of hearing loss, noise and its effects on hearing, warning signs of NIHL, and strategies to prevent NIHL. Anderson (1991) listed another two learning instructions, which were the impacts of hearing loss and a list of dangerous noise-related activities.

The Health Belief Model (HBM) has been used as a health intervention theory to develop the contents of hearing health and other health promotion programmes for many years (Gilles & Paul, 2014; Shabibi et al., 2017). According to Rosenstock (1988), non-healthy behaviours would be changed by improving individual attitudes, knowledge, and beliefs towards noise exposure. This theoretical model postulates that individuals will take actions to prevent NIHL if they regard themselves as (1) susceptible to a condition (perceived susceptibility); (2) if they believe the condition would potentially have serious consequences (perceived severity); (3) if they believe a particular course of action available to them would reduce the susceptibility or severity or lead to other positive outcomes (perceived benefits); (4) if they perceive few negative attributes related to the health action (perceived barriers); and (4) if they believe their actions are effective if they attempt something and the results would be successful (self-efficacy).

The listed learning modules from the reviewed EdHCP covered all the necessary concepts to change students' attitudes and behaviours towards healthy hearing practices. These learning modules helped the students to understand the effects of loud noise exposure on hearing. In turn, the modules would change their belief on dangerous noise exposure. Under the concept of perceived severity and perceived benefits, the students would learn the nature of hearing loss and its consequences. The students would consider hearing loss as having negative consequences and preventing hearing loss as crucial. The students would learn how to protect their hearing by using appropriate HPD and changing their negative thoughts over the use of HPD, e.g., it is expensive, difficult to use, and uncomfortable to use. All these fall under the concept of perceived barriers. Under the concept of self-efficacy, the students would believe that they could change their sound environment or listening habits by using two simple solutions; i) moving away from the noise source and ii) reducing the volume control of music devices. The 3 hearing preventive measures (walk away, turn it down, and wearing HPD) were emphasised in the reviewed programmes (Dangerous Decibels[®], Hear4Tomorrow (H4T) and It's a Noisy Planet. Protect their hearing[®]).

STRATEGY TO FACILITATE A CLASSROOM-BASED EdHCP FOR THE MALAYSIAN YOUTH

The method of presenting a classroom-based educational hearing conservation programme must be relevant to the target group. Instead of using textbooks or teaching in a classroom via the traditional lecture format, interactive activities such as games, posters, and multimedia will make the programme more exciting and impactful (Chermak & Peters-mccarthy, 1991; Folmer, 2002; Griest, 2007). Meinke, et al. (2008) and Martin, et al. (2013) believed that interactive approaches such as multimedia, role-playing

activities, demonstration on hearing protection, group tasks, and discussions were essential to ensure that all the information could be efficiently and effectively conveyed to the students.

Interactive learning activities were incorporated in the reviewed programmes. Activities such as using a Ping-Pong ball and a tuning fork to demonstrate the energy of sound, using a pipe cleaner to model the impact of loud sound on the hair cell damage, and using a SLM for sound measurement activity, were implemented in these programmes. To attract the children, Cheers for Ear introduced a programme mascot. In this case, the use of a mascot or a superhero served as a role model to influence the participants to wear a hearing protection device. As some of these activities were specifically tailored for children, appropriate activities should be considered when focusing on young adults. Therefore, it was recommended for the Malay EdHCP to include its own age-appropriate activities to suit the Malaysian youths' culture.

Group activities and discussions were also conducted in the reviewed programmes. For instance, in Dangerous Decibels® and H4T programmes, the students could discuss the best strategy to prevent noise injury. For high school students, group discussions were highly recommended to encourage them to voice out and exchange their points of view. As recommended by Hameed, et al. (2013), students who were engaged in small group discussions showed a better understanding compared to those involved only in one-way communication lectures.

Multimedia was incorporated in the reviewed programmes as a medium of teaching. Videos on hearing mechanism and hearing loss simulation as well as interactive infographics were shown to help students understand the contents and to improve their concentration during classroom presentations (Wall, 2005; Ljubojevic, 2014). The variations of supplemental materials in infographics or fact sheets produced by It's a Noisy Planet. Protect their Hearing® and Cheers for Ears could be shared among the students and their friends after the programme. Cheers for Ears also provided goodie bags for the students as takeaway materials. Therefore, the nascent Malay EdHCP should consider developing takeaway materials in the form of pamphlets, hand wrists, or patch badges because these could serve as a memento or reminder to the students after the programme.

The use of technology as a multi-component agenda was also noticeable in the reviewed programmes. Some of the programmes developed online games as supplementary materials. For example, Dangerous Decibels® introduced two exhibition programmes for students. The virtual exhibit was a collection of games, demonstrations, and activities. The 2000 square foot OMSI exhibit contained entertaining tools using science and art technology related to hearing and noise exposure. Cheers for Ears introduced an online computer game and a sound level meter application to help students monitor their daily noise dose exposure.

In Dangerous Decibels® and Cheers for Ears, a mannequin with a sound level meter was developed to allow students to measure the music level from their listening devices. The use of mannequins in health education programmes is an excellent way to engage with students and to create interest. This helps them to understand the ultimate goal of the programme. Considering the popularity of technology among young adults, smartphone noise applications or other technology-based tools were recommended to encourage hearing protection use among students (Khan et al., 2018). As a start, free online games or activities such as 'NIOHS Sound meter' developed by the National Institute of Occupational Safety and Health (NIOSH) would be included in the Malay EdHCP.

Nowadays, the Internet is widely used and is considered to be the ideal way of delivering information among students. Based on the Digital 2020 Global Overview report, more than 4 billion people accessed the Internet worldwide, an increment of 7 percent compared to 2019 (Simon, 2020). The reviewed programmes also developed their official websites to convey information on NIHL and prevention strategies to students, teachers, and parents. The programme materials, information sheets, and infographics can be found on these websites. The Malay EdHCP was strongly suggested to develop its official website because it could be a powerful platform to reach young adults in Malaysia.

To evaluate the effectiveness of a programme, comprehensive evaluation tools should be developed. Any recommendations and suggestions for improvements could be derived from these evaluations. The Dangerous Decibels® and H4T developed a comprehensive summative evaluation to gain insight from students and teachers regarding their programmes. The summative evaluation could also be used as evaluation tools to assess the programmes' efficacy, and any changes in the contents could be made based on these findings.

Regarding the programme timeframe, the reviewed programmes lasted no more than 1 hour per session to mimic a normal classroom presentation. This duration is considered appropriate, as it does not exceed the typical classroom learning duration. Meanwhile, the maximum number of students was limited to 40 students per session, as recommended by Shannon (2013). This took the classroom effect size into consideration in order to maintain the programmes' intervention effects.

CHALLENGES AND RECOMMENDATION IN IMPLEMENTING A CLASSROOM-BASED EdHCP IN SCHOOL

Even though the materials and contents for the classroom-based educational hearing conservation programme are accessible globally, there is still a lack of execution in schools. Folmer (2008) recognised several reasons and recommendations regarding the issue of implementation.

Firstly, there is inadequate awareness among the students, teachers, and family members on the impacts of noise, as the symptoms of NIHL itself are insidious. Most of them took this issue for granted, and only realised its significance when the problem became severe. Therefore, Folmer (2008) emphasised the need for public awareness on how and why NIHL occurs. At the same time, parents could encourage their children to practice healthy hearing habits at home. The parents' involvement as role models at home could help students improve their attitudes and behaviours towards noise, as well as motivate them to employ healthy hearing practices (Hackworth et al., 2018).

Secondly, existing health education programmes in schools (e.g., smoking cessation, sex education, or hand hygiene) have already burdened the teachers and students with loads of extra tasks. As a result, the school administrators and teachers are hesitant to conduct any new health education programmes. To reduce the teachers' workload, Folmer (2008) suggested that the message of hearing loss could be conveyed to the students by integrating it into the teachers' lesson plans, especially when delivering subjects like Music, Science, and Health. Therefore, it was recommended for the contents of the Malay EdHCP to be 'teacher-friendly'. This was to ensure these contents could be properly suited into the teachers' lesson plans. Teachers should also be trained to reduce noise levels in the school environment and act as a good role model for healthy hearing behaviours.

Another challenge encountered is the small number of educational audiologists in schools. Folmer (2008) proposed that other health professionals from other related agencies could be invited as guest speakers for a short-term deal in implementing the programme. There are only a few educational audiologists in Malaysia. Thus, collaboration with other professionals, including clinical audiologists or other health professionals working for government hospitals or in private sectors, is essential in making sure that the programme would run effectively. Nevertheless, Rogers, et al. (2009) stressed that the educator or instructor must be qualified and confident to present the contents of the EdHCP. Taking this into consideration, Dangerous Decibels®, H4T and It's a Noisy Planet. Protect their Hearing® offered educator-training workshops for teachers, nurses, or anyone interested. Toolkit instructions, including the instructors' script and programmes' materials could be obtained through the workshops at a minimum cost. Therefore, the Malay EdHCP should develop its training module in Bahasa Malaysia to train school nurses and teachers to ensure their competency in delivering the programmes' contents.

Another recommendation that can be considered is to spread the programmes' message into the programme Doktor Muda (Junior Doctors). Doktor Muda is a peer-to-peer health promotion programme where a selected group of students are trained and empowered to give health education to their peers and to conduct health activities at school (Yusof & Jaafar, 2013). The selected students act as a role model for healthy behaviours and practices. The Doktor Muda programme was introduced by the Malaysian Ministry of Health (MoH) for primary school students in the 1980s, and this initiative is still ongoing until today (Ministry of Health, 2018). Despite the fact that Doktor Muda is aimed at primary school students, its approach or concept can also be applied to students in high schools and universities.

The fourth issue that needs to be highlighted is the lack of mandate. In 2017, the Malaysia National Institute Occupation Safety and Health (NIOSH) and the Malaysian Department of Occupational Safety and Health (DOSH) proposed a programme named "OSH in school". This program aimed to increase awareness among students and teachers on the subject of safety and health in schools (Borneo Post Online, 2017). However, a hearing healthcare syllabus has yet to be introduced in the programme. Perhaps, the Ministry of Education (MoE) or Jabatan Pendidikan Negeri (JPN) could consider introducing or including topics or sections on hearing healthcare in one of their syllabi. It can be implemented through Music and Science subjects or through co-curricular activities to promote hearing preventive measures.

Apart from that, establishing internal policies that promote healthy hearing behaviours and a safe school environment is also recommended. Morata & Meinke (2016) proposed two critical elements in conducting an effective Hearing conservation programme (HCP); i) management and ii) monitoring. These two elements focused on straightening the internal regulations and policies and appointing a key person as an implementer or Hearing conservation administrator (HCA) to monitor the programme. The school principal could adopt internal policies and procedures to reduce noise level during the school day and protect their students and staff. For instance, eliminating or reducing construction/maintenance activities during school hours and setting the noise level standards for school events to be no more than 85dBA. This suggestion is in line with a new regulation enforced by the Malaysian DOSH in 2019 (DOSH, 2019). The school principal should also enforce mandatory HPD use for students and teachers if they need to expose themselves to an unsafe noise level while performing musical instrumentations or attending curriculum activities (such as the marching band).

Funding is one of the crucial issues in implementing any public health promotion programme. The cost for the learning materials should be taken into consideration. In most schools in Malaysia, no specific budget is allocated for this kind of activity. The schools' management are unable or are unwilling to bear the cost. Therefore, it seems reasonable to propose for government assistance through the Ministry of Education or the Ministry of Health to include a specific budget. Support could also be requested from private companies through their Corporate social responsibility (CSR) budget allocation for this kind of programme. This is necessary to ensure the future development and establishment of a Malay EdHCP for young adults in Malaysia.

CONCLUSION

The current paper reviewed existing classroom-based EdHCP, focusing on school children and students. This assessment was done to gain insight about relevant contents for the development of a Malay EdHCP for young adults in Malaysia. The reviewed programmes were analysed, and the challenges and recommendations towards programme sustainability were documented. Since the contents and materials of these programmes were in English and were targeted for schoolchildren, some modifications are required. These modifications are needed to ensure that the contents and materials are appropriate for the Malay EdHCP. The contents also need to be translated and adapted

into Bahasa Malaysia as it is recognised as the national language and is used as the main medium in the education system in Malaysia.

Nonetheless, the development of a Malay EdHCP is only the initial step in promoting healthy hearing practices among young adults in Malaysia. The ongoing implementation and programme sustainability depend on the students and teachers. Public awareness and collaboration from school principals and higher authorities are also vital. All information about the programme must be accessible for students and teachers, and adequate funds must be allocated to carry out the programme in the long run. Without these efforts, establishing a Malay EdHCP for young adults in Malaysia can not be materialised.

ACKNOWLEDGEMENT

This study was funded by the Research Initiative Grant Scheme (Grant no: RIGS 16-136-0300).

REFERENCES

- Addison, I. & Gilliver, M. (2012). Hear4Tomorrow (previously Hear Today, Hear Tomorrow): A school curriculum based hearing health programme. Retrieved May 5, 2019 from <http://hear4tomorrow.nal.gov.au/>
- Anderson, K. L. (1991). Hearing conservation in the public schools revisited. *Seminars in Hearing*, 12(4), 340-364.
- Balanay, J. A. G. & Kearney, G. D. (2015). Attitudes toward noise, perceived hearing symptoms, and reported use of hearing protection among college students: influence of youth culture. *Noise & Health*, 17(79), 394-405.
- Beach, E. F., Gilliver, M. & Williams, W. (2014). A snapshot of young adults' noise exposure reveals evidence of 'binge listening'. *Applied Acoustic*, 77(1), 71-75.
- Borneo Post Online. (2017). Niosh introduces 'OSH in School' programme to make schools safe place for work, study. Retrieved August 5, 2020 from <https://www.theborneopost.com/2017/03/08/niosh-introduces-osh-in-school-programme-to-make-schools-safe-place-for-work-study/>
- Brown, C. S., Emmett, S. D., Robler, S. K. & Tucci, D. L. (2018). Global hearing loss prevention. *Otolaryngologic Clinic of North America*. 51(3), 575-592.
- Carter, L., Williams, W., Black, D. & Bundy, A. (2014). The leisure-noise dilemma: hearing loss or hearsay? What does the literature tell us?. *Ear and Hearing*. 35(5), 491-505.
- Chermak, G. D., Peters-McCarthy, E. (1991). The effectiveness of an educational hearing conservation program for elementary school children. *Language, Speech and Hearing Service at School*, 22(1), 308-312.
- Chesky, K., Pair, M., Lanford, S., & Yoshimura, E. (2009). Attitudes of college music students towards noise in youth culture. *Noise & health*, 11(42), 49-53. <https://doi.org/10.4103/1463-1741.45312>

- Dell, S. M. & Holmes, A. F. (2012). The effect of a hearing conservation on adolescents' attitudes towards noise. *Noise & Health*, 14(56), 39-44.
- Department of Occupational Safety and Health (DOSH). (2019). Occupational Safety and Health (Noise Exposure) Regulations 2019; Department of Occupational Safety and Health Malaysia: Putrajaya, Malaysia, 2019.
- Figg, B. (2018). It's a noisy planet-Protect their hearing: A review of Noise Planet <Noisyplanet.nidcd.nih.gov>. *Journal of Consumer Health on the Internet*, 22(1), 53-62.
- Folmer, R. L.(2008). Hearing-loss prevention practices should be taught in schools. *Seminars in Hearing*, 29(1), 67-80.
- Gilles, A., & Paul, V. H. (2014). Effectiveness of a preventive campaign for noise-induced hearing damage in adolescents. *International Journal of Pediatric Otorhinolaryngology*, 78(4), 604-609. <https://doi.org/10.1016/j.ijporl.2014.01.009>
- Griest, S. E., Folmer, R. L., & Martin, W. H. (2007). Effectiveness of "Dangerous Decibels," a school-based hearing loss prevention program. *American journal of audiology*, 16(2), S165-S181. [https://doi.org/10.1044/1059-0889\(2007/021\)](https://doi.org/10.1044/1059-0889(2007/021))
- Hackworth, N. J., Matthews, J., Westrupp, E. M., Nguyen, C., Phan, T., Scicluna, et al., (2018). What influences parental engagement in early intervention? parent, program and community predictors of enrolment, retention and involvement. *Prevention science: the official journal of the Society for Prevention Research*, 19(7), 880-893. <https://doi.org/10.1007/s11121-018-0897-2>
- Hameed, S., Khalid, T., Aslam, S., Ahmad, M. & Wattoo, F. (2013). Small group discussion-impact on students test scores in an undergraduate pathology course. *Journal of University Medical & Dental College*, 4(1), 17-21.
- Hamzah, N. F. A., Ishak, W. S., & Mazlan, R. (2019). Knowledge, attitude and behaviour towards noise among students of UKM Kuala Lumpur campus. *International Journal of Allied Health Sciences*, 3(1), 557-557.
- Huddle, M. G., Goman, A. M., Kernizan, F. C., Foley, D. M., Price, C., et al. (2017). The economic impact of adult hearing loss: A systematic review. *JAMA Otolaryngology-Head Neck Surgery*, 143(10), 1040-1048.
- Jiang, W., Zhao, F., Guderley, N., & Manchaiah, V. (2016). Daily music exposure dose and hearing problems using personal listening devices in adolescents and young adults: A systematic review. *International Journal of Audiology*, 55(4), 197-205.
- Khan, K. M., Bielko, S. L & McCullagh, M. C. (2018). Efficacy of hearing conservation education programs for youth and young adults: a systematic review. *BMC Public Health*, 18(1), 1286.
- Khan, K. M., Evans, S. S., Bielko, S. L., & Rohlman, D. S. (2018). Efficacy of technology-based interventions to increase the use of hearing protections among adolescent farmworkers. *International Journal of Audiology*, 57(2), 124-134. doi: 10.1080/14992027.2017.1374568.

- Keppler, H., Ingeborg, D., Sofie, D., & Bart, V. (2015). The effects of a hearing education program on recreational noise exposure, attitudes and beliefs toward noise, hearing loss, and hearing protector devices in young adults. *Noise & health*, 17(78), 253–262.
<https://doi.org/10.4103/1463-1741.165028>
- Lass, N. J., Woodford, C. M., Lundeen, C., et al. (1987a). A hearing-conservation program for a junior high school. *Hearing Journal* 40(1), 32-40.
- Lee, G. J. C., Lim, M. Y., Kuan, A. Y. W., et al. (2014). The music listening preferences and habits of youths in Singapore and its relation to leisure noise-induced hearing loss. *Singapore Medical Journal*, 55(2), 72-77.
- Ljubojevic, M., Vaskovic, V., Stankovic, S., et al. (2014). Using supplementary video in multimedia instruction as a teaching tool to increase efficiency of learning and quality of experience. *International Review of research in Open and Distance Learning*, 15(3), 275-291.
- Martin, W. H., Griest, S. E., Sobel, J. L. & Howarth, L. C. (2014). Randomised trial of four noise-induced hearing loss and tinnitus prevention interventions for children. *International Journal of Audiology*, 52(sup1), S41-S49. doi: 10.3109/14992027.2012.743048.
- Meinke, D. K., Martin, W. H., Griest, S. E. et al. (2008). Dangerous Decibels® I : Noise-induced hearing loss and tinnitus prevention in children. Noise exposures, epidemiology, detection, interventions and resources. 9th International Congress on Noise as a Public Health Problem (ICBEN).
- Ministry of Health. (2018). Modul Latihan Kelab Doktor Muda Sekolah Rendah. Kuala Lumpur. Retrieved November,11 2020 from <https://www.infosihat.gov.my/index.php/projek-khas/kelab-doktor-muda>
- Morata, T. C. & Meinke, D. (2016). Uncovering effective strategies for hearing loss prevention. *Acoustics Australia*, 44(1), 67-75.
- Office of Disease Prevention and Health Promotion (ODPHP). (2018). Maternal, infant, and child health. Healthy People 2020. U.S. Department of Health and Human Services. Retrived July 11, 2020 from <https://www.healthypeople.gov/2020/topicsobjectives/topic/maternal-infant-and-child-health/objectives>
- Rawool, V. W. (2012). Hearing Conservation. In *Occupation, Recreational, Educational and Home settings*. Thieme Medical Publishers.
- Rogers, B., Meyer, D., Summey, C. et al. (2009). What makes a successful hearing conservation program?. *American Association of Occupational Health Nurse Journal*, 57(8), 321-337.
- Rosenstock, I. M., Strecher, V. J. & Becker, M. H. (1988). Social Learning Theory and Health Belief Model. *Health Education Quarterly*, 15(2), 175-183.
- Shabibi, P., Zavareh, M., Sayehmiri, K., Qorbani, M., Safari, O., Rastegarimehr, B., & Mansourian, M. (2017). Effect of educational intervention based on the Health Belief Model on promoting self-care behaviors of type-2 diabetes patients. *Electronic physician*, 9(12), 5960-5968.
<https://doi.org/10.19082/5960>

- Simon, K. (2020). Digital 2020: Global digital overview. Retrieved July 18, 2020 from <https://datareportal.com/reports/digital-2020-global-digital-overview>
- Shannon, W. (2013). Providing an educational hearing conservation program for kids. The hearing review. Retrieved March 14, 2019 from <https://www.hearingreview.com/hearing-products/providing-an-educational-hearing-conservation-program-for-kids>
- Stansfeld, S., & Clark, C. (2015). Health effects of noise exposure in children. *Current Environmental Health Reports*, 2(2), 171-178.
- Su, J. Y., Guthridge, S., He, V. Y. & Leach, A. (2020). The impact of hearing impairment on early academic achievement in Aboriginal children living in remote Australia: a data linkage study. *BMC Public Health*, 20(1), 1-13. <https://doi.org/10.1186/s12889-020-09620-6>
- Taljaard, D. S., Leishman, N. F. & Eikelboom, R. H. (2013) Personal listening devices and the prevention of noise-induced hearing loss in children: the Cheers for Ears pilot program. *Noise & Health*, 15(65), 261-268.
- Wall, K, Higgins, S. & Smith, H. (2005). 'The visual helps me understand the complicated things': Pupil views of teaching and learning with interactive whiteboards. *British Journal of Educational Technology*, 36(5), 851-867.
- Warner-Czyz, A. D. & Cain, S. (2016). Age and gender differences in children and adolescents' attitudes toward noise. *International Journal of Audiology*, 55(2), 83-92.
- Widén, S. E, Holmes, A. E & Erlandsson, S. I. (2006). Reported hearing protection use in young adults from Sweden and the USA: Effects of attitude and gender. *International Journal of Audiology*, 45(5), 273-280.
- World Health Organization (WHO). (2015). 1.1 billion people at risk of hearing loss. Media release. Retrieved April 3, 2019 from <https://www.who.int/mediacentre/news/releases/2015/ear-care/en/>
- Yusof, Z. Y., & Jaafar, N. (2013). Health promoting schools and children's oral health related quality of life. *Health and quality of life outcomes*, 11(1), 205. <https://doi.org/10.1186/1477-7525-11-205>.
- Zhao, F., Manchaiah, V. K., French, D. & Price, S. M. (2010). Music exposure and hearing disorders: An overview. *International Journal of Audiology*, 49(1), 54-64.