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Malaysian National Society of Audiologists

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Preface

MANSA e-bulletin 2021 vol. 2 comprised of articles that capture experience and practice, research, views or discussions surrounding hearing care related issues. In this edition, we welcome the contributions from Audiology students, academics, as well as hearing care professionals. There are 5 main chapters in this edition covering various audiology-related topics, which are hoped to benefit readers from various settings.

Chapter 1 revolves around discussions on Fundamental concepts in audiology, including physiology of hearing, a commentary on the world report on hearing by World Health Organization (WHO), and a historical background of hearing aids development. This chapter intends to give an overview to the reader regarding the basic concepts in the Audiology field.

Chapter 2 discusses the different Audiological assessment tools available today. In this chapter, we introduce the inventions of diagnostic and screening tools by our local researchers. This includes the introduction of the newly developed Malay hearing screening tool and the Mandarin speech test. In addition, the overview of the readily available diagnostic tools, such as Threshold Equalizing Noise (TEN) and Auditory steady-state response (ASSR), are also included in this chapter.

The discussions in chapter 3 revolve around Audiological rehabilitation & management, including clinical experience for aural rehabilitation, as well as the discussion on how involvement of families could be integrated in the Audiological management of hearing-impaired patients. Apart from that, discussions on vertigo and tinnitus management are also included. Inputs in this chapter are hoped to benefit the reader in planning their rehabilitation and management in their Audiology clinic.

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Preface

Chapter 4 pools articles that discuss hearing conservation. There are commentaries on Occupational and Safety Health (OSH) Noise Exposure Regulations 2019 from student and clinician perspectives. Other than that, this chapter also discusses the knowledge and attitudes towards noise among students in rural areas. The chapter ends with the overview of hearing conservation guidelines for musicians. Contributions from authors in this chapter demonstrate that hearing conservation is one of the main areas of interest among Audiologists in Malaysia.

Chapter 5 discusses teaching and learning issues from both student and teacher's perspective. Interestingly, this chapter discusses the impact of Covid-19 towards teaching and learning, as well as the clinical training of Audiology in different universities offering Audiology courses in Malaysia. A similar trend that was observed from all the articles is that Covid-19 renders the opportunity for improvements in the delivery of education and that the universities are in a continuous effort to provide a high-quality education to the Audiology students despite the limitations and challenges resulting from the Covid-19 pandemic.

It is hoped that this edition could be a platform for continuous knowledge exchange among the Malaysian health-care community in general. The production of this issue would not be possible without the contribution of an amazing editorial team, as well as the esteemed authors. My heartiest thanks to all the editors for their immense hard work, and authors for their contributions. It is my hope that more contributions from authors, both students and professionals, will be made in the future, and that the culture of sharing knowledge via this bulletin will continue for many generations to come.

Kind regards,

Dr Sarah Rahmat

Editor-in-Chief
MANSA e-Bulletin Vol.2 2021

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Message from the President

Dear MANSA Members

Assalamualaikum,

This past year has been remarkable yet demanding in so many ways. We hope that our readers and members are well and looking forward to a better year ahead. Despite the difficult circumstances, MANSA has risen to the challenge and has managed to sustain and innovate its activities variously.

I am indebted to the Editor-in-Chief, Dr Sarah Rahmat and our dedicated members of the Editorial Board for the dedication and tremendous effort in creating this e-bulletin. The recent success of the e-bulletin is a testimony to their commitment.

I would also want to take this opportunity to acknowledge the great articles contributed by the audiologists in Malaysia. A huge thank you to everyone who has contributed to the wonderful and inspiring articles, which without them this e-bulletin would not be realised.

Throughout the past years, audiologists have carried out important works in research, clinical care, and education. We did this in a dedicated and creative ways. This e-bulletin highlights and provides not only avenue for audiologists to share their thoughts, experience and research findings but also to extend this platform beyond our clinical world and into the larger intellectual community. This is one of the important goals of MANSA in order to promote excellence in the Audiology field through professional development and advocacy.

Please enjoy your reading and we look forward to more intellectual contributions from the members.

"Write to be understood, speak to be heard, read to grow. – Lawrence Clark Powell"

Kind regards,

Dr Nurul Huda Bani

President
Malaysian National Society of Audiologists
2020-2022

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Chapter 1

Fundamental of Audiology

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COCHLEA: THE VITAL ORGAN OF HEARING

By Rafidah Hassan Mydin

Cochlea is a vital part of the inner ear containing the sensory organ of hearing that plays an important role in the sensation of hearing and auditory transmission. The word cochlea is derived from the Greek word **'Κοχλίας'** for snail, because of its resemblance. The cochlea is a spiral tube that coils into two and one-half turns around a hollow central pillar, the modiolus. The cochlea is about 9.0 mm in diameter at its base, 5.0 mm at its apex, and when uncoiled, the length can extend to about 32 mm (1). The hollow centre of the modiolus encompasses the cochlear artery, vein and fibre of the cochlear nerve.

The cochlea tube is divided into 3 main fluid-filled chambers: scala tympani, scala vestibuli, and scala media (Figure 1). Both scala vestibuli and scala tympani are filled with perilymphatic fluid (blue) and the scala media filled with endolymph fluid (green). The Organ of Corti is situated between scala media and the scala tympani, while the neural elements are spiral ganglion neurons and auditory nerve at the modiolar plane (2).

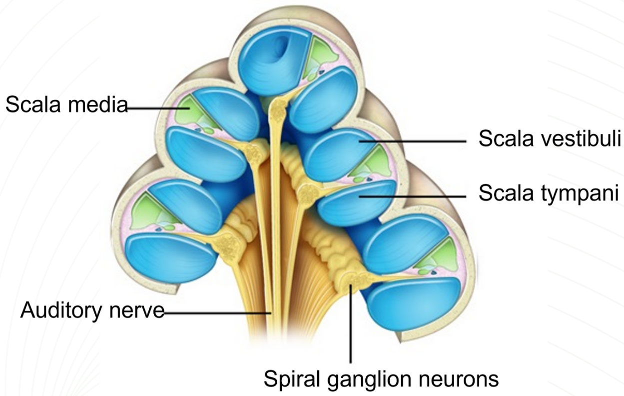

Figure 1: *A cross-section of the cochlea (drawing by S. Blatrix, from http://www.cochlea.eu/en/cochlea EDU website by R. Pujol et al., U. Montpellier) (2).*

Scala media is situated in the middle, the upper border separating it from Scala vestibuli is called Reissner's membrane, while the lower border separating it from scala tympani is called basilar membrane, where the organ of Corti is located (refer Figure 2). Scala vestibuli is connected to the oval window whereas scala tympani is connected to the round window, and both join at the apex of the cochlea called helicotrema. The basilar membrane is attached to the outer wall of the cochlea by the spiral ligament and to the osseous spiral lamina through modiolus (3).

The basilar membrane is narrower and stiffer at the base than at the apex, allowing different perceptions of sound along the membrane ranging from high to low frequency sounds (4). The hair cells in the organ of Corti are divided into two types: the inner hair cells (IHCs) that form a single row of 3,500 cells and the outer hair cells (OHCs) that form three rows with typically about 12,000 cells located on the outer side of the pillar cells (5).

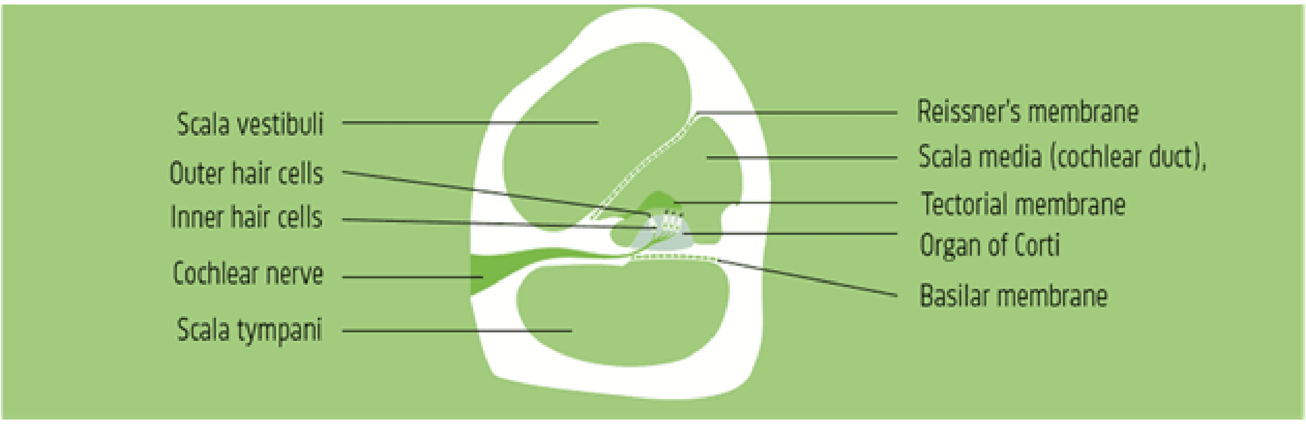

Figure 2: *Cross section of single turn of cochlea. (Copyright: © Hottinger Brüel & Kjær) (3).*

Auditory vibrations are transmitted from the tympanic membrane through the ossicles into the oval window via stapes footplate. The vibrations set the perilymph in the scala vestibuli and scala tympani into motion. The motions of the fluid set up traveling waves along the basilar membrane that stimulate the hair cells in the organ of Corti whereby the mechanical energy being converted into electrical energy. This energy yields in neural impulses, that travels through the afferent nerve fibres to the brain stem and up to the nervous system to be perceived as sound in the brain (4).

As complex and precious this organ contributes to our hearing system, it is also very fragile, and vulnerable to damage. Knowing and learning about cochlea should also raise awareness to care and protect the organ from potential harm (eg: excessive noise or trauma) that eventually could lead to permanent damage and hearing loss to humans.

"The word cochlea is derived from the Greek word 'Κοχλίας' for snail, because of its resemblance."

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UNIVERSAL HEARING HEALTH CARE: CHALLENGES VERSUS OPPORTUNITY

By Siti Suriani binti Che Hussin

In 2017, 70th World Health Assembly (WHA 70.13) was held at the Palais des Nations, Geneva. For the reader's information, the World Health Assembly is the highest decision-making body of the World Health Organization (WHO). The WHA resolution is to promote ear and hearing care (EHC) through these campaign: i) A world report on hearing; ii) advocacy on the World Hearing Day; ii) 'Make Listening Safe' initiative to prevent noise-induced hearing loss; iv) A toolkit of technical support and a guide in planning and implementation of the EHC, and v) A multi-stakeholder engagement to prevent and address hearing loss globally (1). In the context of these resolutions, WHO objectives are to raise awareness for prioritization of the EHC, mitigate preventable causes of hearing loss, and ensure that the EHC is accessible to all (2).. On the 3rd March 2021, WHO released the first 'World Report on Hearing' which was launched on the World Hearing Day. This report was developed based on the best available evidence by experts and stakeholders in EHC (3). Generally, the World Hearing Day 2021 and the World Report on Hearing present a global call for action to address hearing loss and ear diseases across the life course.

The tagline of the World Report on Hearing is '**Hearing Care for All**' which highlights four key messages: i) The number of people living with unaddressed hearing loss and ear diseases is unacceptable; ii) Timely action is needed to prevent and address hearing loss across the life course; iii) Investing in cost-effective interventions will benefit people with hearing loss and bring financial gains to the society; and iv) Countries must integrate people-centered ear and hearing care (IPC-EHC) within the national health plans for universal health coverage (4). This first-ever World Report on Hearing elaborates all these points and shares potential solutions to guide regional and country-level action on hearing loss.

Hearing loss is on the rise, and we must prepare for it. Currently, around 430 million people globally require rehabilitation services for their hearing loss, and the WHO estimates that the number could rise to over 700 million by 2050 (5). The rising numbers is a huge demand for us either as policy makers, civil society, professionals, industry players and individuals. However, there are some challenges to implement ear and hearing care, such as poor access to the services, poor documentation, lack of human resources, lack of accurate information on ear disease and hearing loss, inadequate regulations, and lack of funding, especially in low and middle-income countries (3). These are the significant challenges and can be overcome by re-making the strategic planning and allocating priority for each initiative.

"Currently, around 430 million people globally require rehabilitation services for their hearing loss, and the WHO estimates that the number could rise to over 700 million by 2050 (5)"

The World Report on Hearing outlines that the shift in the global epidemiological distribution of hearing loss, addressing the hearing loss should be of a public health priority, and highlights best practices and priority actions to promote ear and hearing care. Importantly, it provides a range of implementable interventions adopted by countries such as Malaysia. Addressing hearing loss will significantly contribute to meeting important Sustainable Development Goals (SDGs) as an integral part of universal health coverage (No 3. Good health and well-being, aims to provide equitable care to all). WHO also recommends universal access to quality EHC by summarizes in the acronym “H.E.A.R.I.N.G” (Hearing screening and intervention, Ear disease prevention, and management, Access to technologies, Rehabilitation services, Improved communication, Noise reduction, and Greater community engagement) (3).

The World Report on Hearing is a landmark opportunity enabling all of us to unite, collaborate, and advocate globally. Hearing loss is a public health issue and can be addressed by a public health approach. Preventing hearing loss is possible, and the best prevention is first to become aware of it. To deliver the mandate provided by the World Report on Hearing, let's initiate and participate in the EHC activities.

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DO MEN HEAR AND LISTEN DIFFERENTLY THAN WOMEN?

By Rafidah Hassan Mydin

Hearing is a complex sensory process, starting from the outer ear, middle ear, inner ear and up to the central process of signaling sound to the brain. While the hearing mechanism is the same for both men and women, studies showed that both sexes hear and listen differently. These differences are portrayed across a variety of parameters by researchers. It is interesting to highlight their findings on gender differences from various aspects including ear anatomy, peripheral and central auditory physiology involving objective testing, and other subjective measures such as binaural sound processing ability. Susceptibility and possible contributing factors to hearing loss between genders are also discussed concisely in this article. This information will provide guidance in understanding audiological measures and will also be helpful in managing individuals with hearing loss.

Anatomical and physiological difference of ear between genders

Anatomical differences are identified as one of the elements that contribute to the gender differences in hearing. Pinna, the visible part of the ear, acts as a kind of funnel that assists in directing the sound further into the ear. Bigger funnels (like the ear trumpet) are expected to collect more sound waves, which help to hear the sound better. Sullivan et.al reported that the height of the pinna was significantly larger in men compared to women by approximately 6.5% (1). This could be one of the factors contributing to differences in hearing between men and women. In addition, males have a larger diameter of head size on average compared to females, which could have affected the latency of click evoked Auditory Brainstem Response (ABR) results in several studies (2). This unique feature of man's head size is believed to allow males to localize sounds better than females.

Apart from that, the difference in the inner ear also significantly affects the hearing. Otoliths structure in the inner ear tends to be larger in males thus allowing them to have better spatial orientation than females in some environments. In addition, several researchers found that males have longer cochlear ducts than females. It has been postulated that shorter cochlear length in females results in a faster response time and a greater synchronous activity at the level of the spiral ganglion afferents, as well as a shorter afferent auditory pathway, which contributes to greater ABR wave amplitudes and shorter wave latencies (3).

Physiological changes observed in Otoacoustic Emissions (OAEs) testing between genders have been recorded by several researchers. One study found that female infants produce significantly greater-amplitude and more numerous OAEs compared to male infants. In addition, Penner and Zhang, reported Spontaneous Otoacoustic Emissions (SOAEs) are more likely to be recorded in 80% of female listeners compared to approximately 60% of male listeners (4).

"Hearing loss is greater in males due to their involvement in noisy leisure activities like woodworking, shooting and hunting"

Click Evoked Otoacoustic Emission (CEOAE) is also found to be larger in females compared to males. However in Distortion Product Otoacoustic Emission (DPOAE) testing, minimal differences in magnitude were observed between genders.

Prevalence of hearing loss and the affected frequency

Several studies found that women have better hearing at frequencies above 2 kHz, particularly at 4 kHz, compared to men (5). Similar findings have been reported in other adult studies, showing women were more sensitive to high frequency sounds than the males counterparts (6). A similar pattern was found in studies among Caucasian, African-American, and Asian adults (7). A more recent study also found that the prevalence of hearing loss was higher in males than in females with the prevalence of 7.3% and 4.8% respectively (8).

Factors contributing to sex differences in hearing

Hearing loss is greater in males due to their involvement in noisy leisure activities like woodworking, shooting and hunting. The nature of their working environment especially in factories, military and construction lines also expose them to a greater risk of noise exposure than females. Shuster et al. reported that many studies found that hearing sensitivity reduces more rapidly among males compared to females especially at high frequency regions due to males being more exposed to noise induced hearing loss (9).

While in females, factors such as estrogen hormone play a crucial role in hearing maintenance and improving auditory function when the serum estrogen level drops, rapid declines in hearing thresholds were seen in postmenopausal women.

Auditory processing and listening style differences in gender

Listening is the process of how an individual perceives, processes and understands oral messages and many researchers agreed that men listen differently than women. Females used both sides of the brain hemisphere in the phonological process while males mostly used the left hemisphere). The same finding was found in a dichotic listening test, where males dominantly used the right ear to perform the task while females performed similarly on both sides of the ears. Sax supported these findings, claiming that females are less tolerable to louder background noise, yet have greater sensitivity to sounds, averagely 6 to 8 dB higher than males (7). The style of listening in females is more people-oriented while males are more action-, content, and time oriented.

These findings on the sex difference help to understand the incidence of hearing and language impairment reported by male and female patients, while providing guidance to clinicians in formulating better healthcare-related hearing policies and therapeutic approaches to both sexes.

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HEARING INSTRUMENTS: A BRIEF HISTORY

By Patrick Seow Wi Liam

For as long as humans have relied on hearing, there are those that have to make do without. Hearing aids are a ubiquitous tool found in every audiologist's arsenal. Often, we offer them as the primary solution to treat hearing loss. Therefore, it would be unfathomable to the profession if we did not have access to these wonderful devices. This article aims to shed some light on the timeline of hearing instruments and how they have evolved over time.

Animal Horns (1200-1700s)

These primitive tools were fashioned out of the horns of large bovine beasts such as cattle or bison. The narrow tip of the horn would be placed near the opening of the ear canal while the wider aperture of the horn can be directed towards the sound source. By hollowing out the insides, the ancient man was able to shape the bone into a funnel-like structure that acted as a conduit for acoustic signals.

Ear trumpets (1700-1800s)

A fresh take on the aforementioned animal horn, the ear trumpet was an instrument wielded by those who were hard of hearing during the eighteenth century. Ear trumpets do not actually amplify sound, but merely act as a funnel to direct sound into the external ear much like its predecessor.

Akouphone (1898)

The Akouphone was a brainchild of Miller Hutchinson. The Akouphone, invented shortly after the telephone, was the world's first electric hearing aid. Hutchinson's device works by utilising a carbon transmitter and electric current to amplify soft acoustic signals (1). The appearance of the telephone played a significant role in ensuring the contrivance of the Akouphone. This is because the contemporary technology that went into creating the telephone was used to develop components of the Akouphone that allowed it to orchestrate the intensity and frequency of an output signal. Thus, soft sounds can now be made louder, thereby successfully treating patients with mild and moderate hearing loss. Being the first of its kind, the Akouphone is liable to drawbacks of its own, namely, portability or lack thereof. The large and bulky device limits its use outdoors and in social situations that require mobility. Nevertheless, the era of electric hearing aids has begun.

Vacuum-Tube hearing aids (1921)

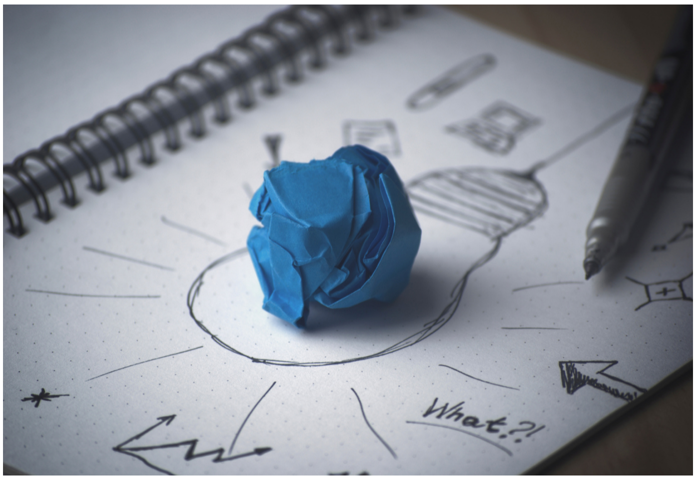
Necessity is the mother of invention. The need for portability led to the innovation of the vacuum-tube hearing aids. Vacuum-tubes are able to convert speech signals into electrical signals (2). These electric signals are then amplified and sent to the receiver where it is picked up by the user's ear. Unlike the Akouphone, vacuum-tube hearing aids can treat even those with severe hearing loss. The downside to vacuum-tubes is that they rapidly heat up and are prone to breaking. Not unlike the "bag" mobile phones, these hearing aids can be carried around in a suitcase and weigh nearly as much. The invention eventually grew in popularity to the point that it was commercially available to the public just two years after its inception.

Transistor hearing aids (1947)

The arrival of transistors in 1947 shook the electronics industry. No market was spared, least of all hearing aids. Transistors quickly replaced vacuum-tubes because they produced less distortion and heat which vastly improved the quality of sound and device. Moreover, transistors were less power hungry. Due to the reduced energy consumption hearing aids could be connected to smaller batteries resulting in a reduction in the overall size of hearing aids.

Digital hearing aids (Late 1900s)

The use of transistor hearing aids ended when the integrated circuit was introduced to the hearing aid industry. The first behind-the-ear hearing aid was invented in 1964 and resembles the device which we are familiar with today. Microprocessors and multichannel compression would pioneer the shift of hearing aids from analogue to digital (3). In 1985, digital signal processing chips were used in hearing aids and the first hybrid analogue-digital hearing aid was sold. By 1996, Senso by Widex had become the first entirely digital hearing aid to appear in the market.



"Microprocessors and multichannel compression would pioneer the shift of hearing aids from analogue to digital."

Present Day

Now, numerous innovative features have been added to the repertoire of hearing aids to augment its function as an amplification device. These are just a few of the features available in the latest hearing aids:

Artificial intelligence
Touch-sensitive controls
Bluetooth connectivity
Rechargeable batteries

The development of hearing instruments progressed exponentially. Just a decade ago, we manually programmed hearing aids with a screwdriver. No doubt, the field of audiology is relatively new and subject to rapid growth. Unlike the Luddites, we do not have the luxury of time to stall the progress of the industry. While we strive to keep up with the tides of change, it is imperative that we never forget how we came to be. Indeed, if there is a lesson that can be learned from this, it is that we will never be able to predict what tomorrow shall bring.

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Chapter 2

Audiological Assessment

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SELF-REPORTED HEARING LOSS AS AN ALTERNATIVE HEARING SCREENING TOOL AMONG ADULTS: AN INTRODUCTION TO INVENTORI LAPORAN MASALAH PENDENGARAN (ILAMP)

By Najihah Amir, Sarah Rahmat & Marina Alisaputri Lamri

According to the World Health Organization, around 2.5 billion people are expected to experience at least some degree of hearing loss by 2050. Out of the projection, only 20% sought medical help and left 80% with undetected hearing loss (1). Of these, the World Health Organization estimated that 430 million people require audiological rehabilitation to address their hearing disability. People with undetected hearing loss are very difficult to get employed due to communication difficulties among workers, low educational attainment levels and may have negative emotional impacts such as loneliness, social isolation, frustration, and depression (2). Thus, early detection of hearing loss is necessary to prevent the negative consequences of hearing loss.

The early detection of hearing loss can be done through hearing screening which is usually administered using various instruments including Pure Tone Audiometry (PTA), Otoacoustic Emissions (OAEs), Auditory Brainstem Response (ABR), and self-reported hearing loss questions. The instrument for hearing screening should be valid and accurate to detect hearing loss. Thus, the selection of an appropriate instrument is essential to provide an accurate diagnosis, as well as a cost and time effective screening program.

Although PTA gives high sensitivity and specificity as a screening tool to detect hearing loss, the use of PTA in screening could be costly, requires trained personnel, calibrated audiometric equipment, as well as a quiet environment with low level of ambient noise which complies American National Standards Institute (ANSI) requirements. The use of PTA requires annual calibrations to meet ANSI specifications which is costly and could not be feasible in a condition where the ambient noise is

> ***"The development of ILaMP may potentially enable its use as a hearing screening tool, for example, when conducting screening in rural areas or during tele-audiology clinical sessions."***

high and no competence tester available, or when there is no allocation to buy equipment to conduct hearing screening. As an alternative to the PTA use in hearing screening, the previous study has shown that self-reported hearing loss questions can be used as a tool for hearing screening as it is easily administered, cost- and time-efficient (3).

Hearing screening using self-reported hearing loss questions can be administered in two ways either by: 1) self-administration or 2) interview. Through self-administered questions, the subjects will be given the questions and need to report the status of their hearing. Each response from the subjects will be evaluated to determine whether the subjects pass the hearing screening. Another method of administration of self-reported hearing loss questions is through interviews in which the

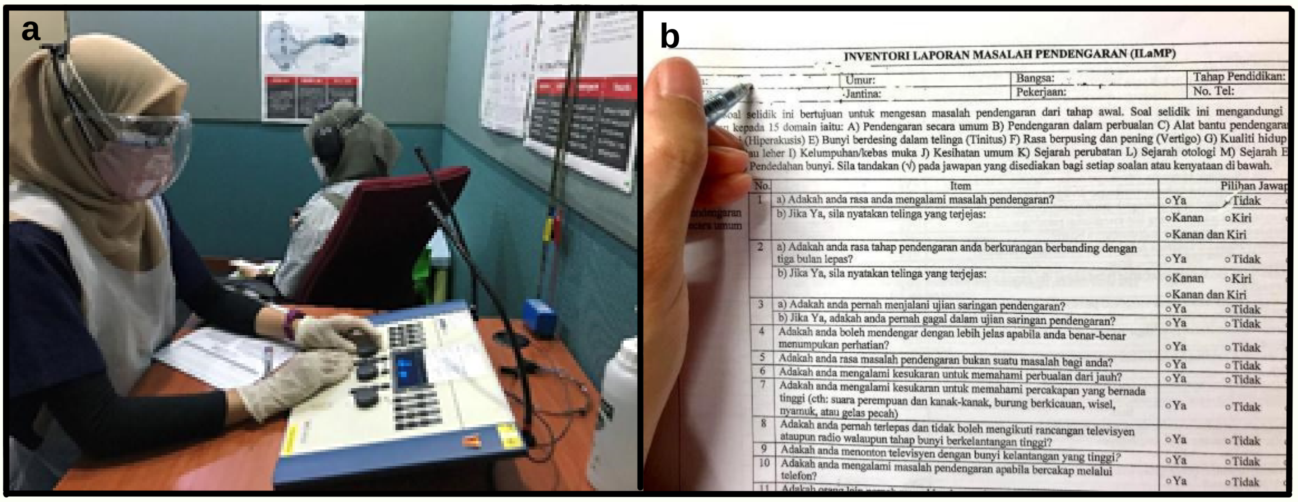

Figure 1: Screening process using a) Pure Tone Audiometry and b) self-report hearing questions

healthcare professionals ask a single or a series of question (s) to the subjects such as ‘Do you have a problem with your hearing?’ or ‘Do you feel you have a hearing loss?’ (3). A previous study has shown that the use of multiple questions is more sensitive to detect hearing loss than the use of a single question (4).

An ongoing study by the authors focuses on developing a Malay self-reported hearing loss inventory for adults known as Inventori Laporan Masalah Pendengaran (ILaMP). The development of ILaMP was initiated due to the fact that there was no comprehensive self-reported hearing loss survey available in Malay. A pilot study of ILaMP on 90 subjects has been conducted. The initial analysis showed that ILaMP can differentiate between normal hearing and hearing loss subjects ($p < 0.05$). It has a good potential to be used as an alternative hearing screening tool due to its performance, easy administration, and cost- and time- efficiency.

However, further investigation on the sensitivity, specificity, and accuracy of ILaMP needs to be conducted on a larger population.

Self-reported hearing loss could not replace the Pure Tone Audiometry in screening, but could be an alternative screening tool when PTA is unavailable. The development of ILaMP may potentially enable its use as a hearing screening tool, for example, when conducting screening in rural areas or during tele- audiology clinical sessions. It is hoped that ILaMP could become a benchmark effort towards early detection of hearing loss among adults in Malaysia.

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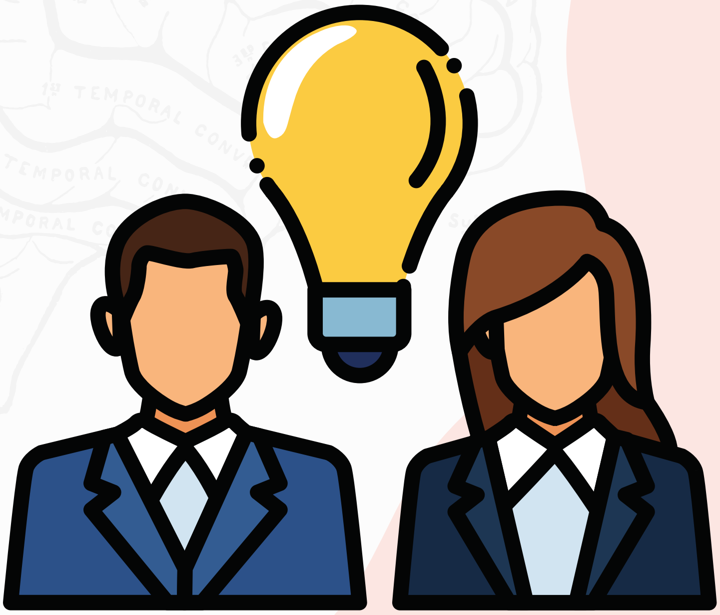
HEARING THRESHOLD ESTIMATION: AUDIOLOGIST'S PERSPECTIVE ON AUDITORY STEADY-STATE RESPONSE



By Muhammad Shafiq Imran bin Anual & Nurul Fatin binti Fikri

Measurement of hearing thresholds is important in determining the hearing level of a person. In most cases, audiologists use pure tone audiometry (PTA) to assess the degree of hearing loss. This behavioural test is non-invasive, and the outcome represents how a person detects sound. In addition, PTA's outcome is a piece of primary information needed for hearing aids fitting, i.e., to decide the amount of amplification gain. However, PTA has some issues that may introduce errors on the hearing level outcome. It can be manipulated by malingerers and easily affected by attention and cooperation, particularly in paediatric cases. Unreliable outcomes of assessment may lead to ineffective management. To solve these issues, audiologists often resort to objective tests to measure or estimate hearing thresholds such as Auditory Steady-State Response (ASSR) and Auditory Brainstem Response (ABR).

ASSR is an objective electrophysiological hearing test evoked by a repetitive auditory stimulus. This test is capable of estimating frequency-specific hearing thresholds up to 120 dB nHL. It can be run simultaneously in both ears, in which the testing time is reduced tremendously. More notably, it employs an automated response detection, making it easier for an audiologist to obtain estimated hearing thresholds. Especially for children, early detection of hearing loss is a critical step in hearing aids fitting so that the children can still acquire speech and language with the auditory stimulation provided by the hearing aids. For this reason, ASSR can be conveniently performed. Furthermore, ASSR can also be used to assess an adult's hearing status, and the results can be combined with the results of other tests to yield a diagnosis or conclusion about hearing. Because ASSR is an objective test, the results can be used to rule out any non-organic hearing loss in both adult and paediatric cases. Unlike behavioural tests, patients are not required to perform any task during the ASSR assessment. The scalp electrodes placed on specific locations will record the brain activity following the auditory stimulation.

Due to limited normative data of ASSR and debates on its reliability, Auditory Brainstem Response (ABR) is preferred by audiologists in estimating hearing thresholds. Nonetheless, recent research and development in ASSR enhances its diagnostic usefulness. Different stimuli such as NB CE-Chirps, amplitude-modulated (AM) noise or tones, or frequency-modulated (FM) tones are available to record ASSR. Some ASSR systems combine the algorithm method (AM and FM) and incorporate higher harmonics in their detection algorithms. Compared to ABR, ASSR is more accurate in estimating pure tone thresholds with reduced testing time (1). A recent study by Sininger et al. revealed that ASSR threshold is lower than ABR and closer to PTA threshold in normal hearing population, which is substantial (2). Moreover, ASSR can be recorded with a wide range of modulation frequencies (MFs), i.e., between 10 to 90 Hz. Audiologists commonly use 40 Hz and 90 Hz for hearing threshold prediction.

When evoked with 40 Hz MF (Figure 1), the ASSR is easily identified, and the amplitude obtained is relatively large. In fact, this response is present at intensity levels near behavioural thresholds and thus it could be used to predict hearing levels of an individual. Rance (2008) suggested that 40 Hz ASSR is contributed by neural generators at cortical levels, while higher MFs (60 Hz and above) response is generated predominantly by subcortical areas (3). Jalaei et al. (2017) recommended the ASSR of 40 Hz as an optimum setting for threshold acquisition at least for young adults, as it produced the lowest mean threshold compared to 90 Hz (4).

Several considerations need to be taken by an audiologist before deciding the use of 40 Hz ASSR in the clinic, despite its advantages. Firstly, the response may not be reliable when testing infants and young children. Both groups have peak amplitudes at higher MFs (more than 80 Hz). Secondly, the responses can only be reliable if the individuals are awake. That is, the 40 Hz ASSR is highly dependent on the subject's state, which is analogous to Auditory Late Response (ALR).

The MF issues in ASSR have been the subject of interest. The rate of MF may affect the signal-to-noise ratio (SNR) during ASSR testing for infants and young children. According to Pethe et al. , SNR for ASSR in young children is better at higher MFs compared to lower MFs (5). Biological noise levels (electroencephalogram and myogenic activities) are reduced at higher MFs, whether in sedated or in natural sleep conditions. Moreover, Pethe et al. also suggested that 13 years old is a critical age where the optimal MF changes from high to low frequency range (5). Taken together, neural maturation is a dominant factor for this age group population. The immature auditory cortex causes difficulties to sustain a rhythmic response at lower MFs.

"ASSR is an objective electrophysiological hearing test evoked by a repetitive auditory stimulus."

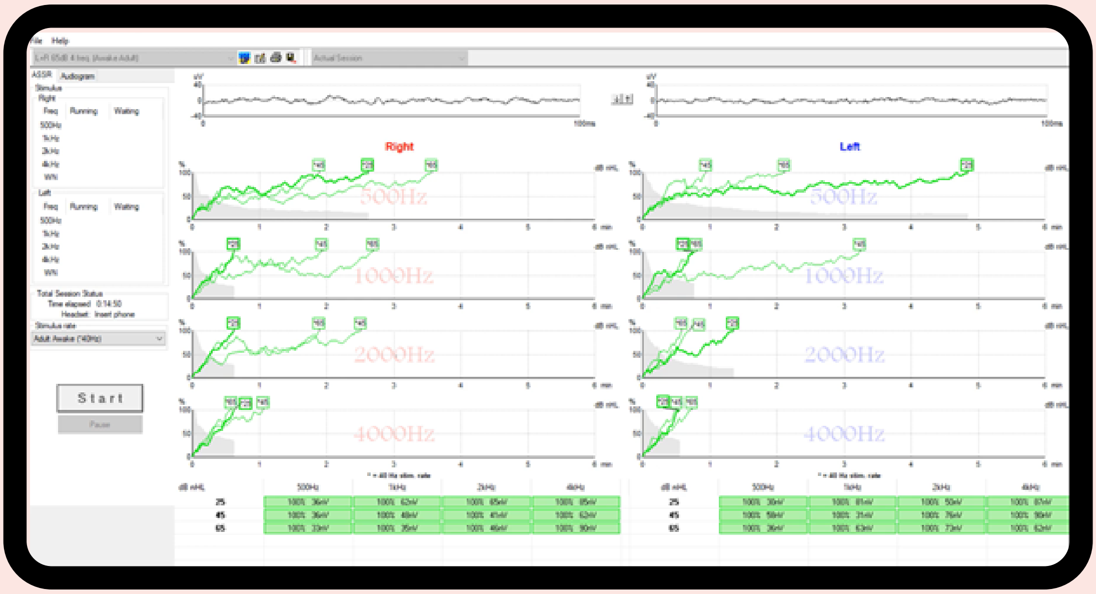


Figure 1: *40 Hz MF response recorded in ASSR test screen.*

Therefore, we can conclude that higher MFs (80 Hz or more) are better for the assessment of hearing thresholds in children, whereas lower MFs (40 Hz) are better when testing adults.

Year after year, technology in hearing assessment has advanced, particularly in ASSR, which now provides ear-specific hearing threshold measurements, as well as reliable and quick multiple frequency testing. Moreover, ASSR continues to raise the bar, and it is exciting to see various research done locally and internationally on this topic to provide Malaysian audiologists with more scientific evidence, which contributes significantly to clinical decision making.

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THE MANDARIN FRICATIVE-AFFRICATE (MFA) NONSENSE WORD TEST

By Chong Foong Yen, Rafidah Mazlan, Lee Onn Wah, Nashrah Maamor, Norfazilah Abdol, & Choey Lai Pheng

Malaysia is a multi-ethnic and multi-cultural country where Chinese is the second largest group, making up 22.4% of the Malaysian population (1). Mandarin plays an important role among the Chinese ethnic in Malaysia because it is the learning and teaching medium in Chinese vernacular schools. In audiology clinics, it is essential to assess patients' speech perception ability using their native language to reflect their performance accurately. Mandarin speech perception tests have been developed in Taiwan and China. However, these tests may not be suitable to Malaysian Chinese due to vocabulary differences of spoken Mandarin among the Malaysian, Taiwanese and Mainland Chinese. There are 22 consonants in Mandarin and half of them are high-frequency consonants, including five fricatives (labial /f/; alveolar /s/; retroflex /ʂ/; palatal /ɕ/; velar /x/) and six affricates (alveolar /ts/ and /tsʰ/; retroflex, /ʈʂ/ and /ʈʂʰ/; palatal, /tɕ/ and /tɕʰ/). High-frequency consonants play an important role in speech understanding. Patients with hearing loss, especially at high frequencies, struggle with speech understanding in noisy environments because of the reduced competency in detecting or discriminating the high-frequency consonants. Hearing loss at high frequencies, for example, due to presbycusis, ototoxicity and noise-induced hearing loss will cause the high frequency consonants to be inaudible. Therefore, there is a need to develop a speech perception test that emphasizes high frequency consonants to assess the perception of those consonants among Mandarin-speaking individuals in Malaysia. Researchers from Universiti Kebangsaan Malaysia (UKM) have been developing a speech perception test that emphasizes Mandarin consonants with high frequency content since 2018. This article summarizes the development time course of the Mandarin Fricative-Affricate (MFA) Nonsense Word Test (2, 3).

In the first study, the researchers aimed to select the best digitally recorded nonsense word tokens as the test materials (2). The recording samples consisted of three vowels (/a/, /i/ and /u/) and six Mandarin fricative and affricate consonants (/s/, /ʂ/, /ts/, /tsʰ/, /ʈʂ/ and /ʈʂʰ/ that correspond to 's', 'sh', 'z', 'c', 'zh', and 'ch', respectively in Pinyin), paired into vowel-consonant-vowel (VCV) format (e.g., /usu/, /asa/ and /isi/). A total of 180 VCV words were recorded from a male and a female Mandarin speaker. Examinations of the acoustic waveforms and spectrograms of all VCV samples were done to screen for idiosyncrasy elements. VCV samples without the idiosyncrasy elements were selected and evaluated in terms of sound quality by two Mandarin speakers who have undergone phonetic training. The VCV samples were rated from 1 to 5, and those that received good (score 4) and excellent (score 5) ratings were selected for validation by 21 young native Mandarin-speaking adults. VCV samples with the highest identification score were selected as the test materials for developing the MFA Nonsense Word Test (2).

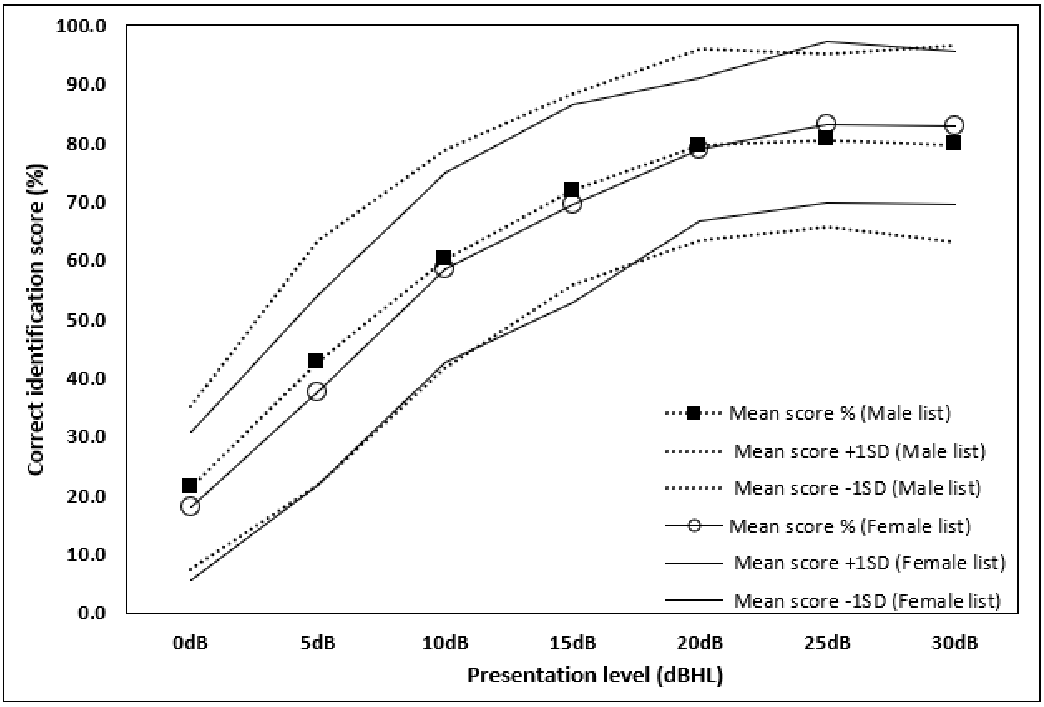

Figure 1: *Preliminary performance-intensity functions for the MFA Nonsense Word Test. The dotted line with black squares indicates the mean identification scores (%) obtained with the male-speaker list. The upper and lower dotted lines indicate the + 1SD scores for the male-talker list, respectively. The solid black line with open circles indicates the mean identification scores (%) obtained with the female-speaker list. The upper and lower solid lines indicate the + 1SD scores for the female-talker list, respectively.*

In a subsequent study, the researchers aimed to collect normative data by determining the psychometric function of the MFA Nonsense Word Test (3). The study involved 65 native Mandarin-speaking young adults with normal hearing. Ten subjects participated in a pilot study to identify seven intensities which included performance levels of 10%, 20%, 50%, 80% and 90%. The remaining 55 subjects (46 females and nine males) participated in the field study where the identification performance for the Mandarin fricative and affricate consonants was examined. The identification testing was conducted at 0 to 30 dBHL intensity level in a 5-dB decrement step size. In total, each subject was presented with 252 VCV stimuli monaurally. The identification scores at 0, 5, 10, 15, 20, 25, and 30 dB HL were plotted as a psychometric function. The researchers reported that (i) there was no significant gender talker effect on the subject identification mean scores, except at 5 dB HL, (ii) there was a significant intensity effect from 0 to 25 dB, suggesting the identification performance increased as the intensity increased and was likely to reach a plateau at 25 dBHL; and (iii) the most frequently confused consonants were between alveolar and retroflex consonants (‘c–ch’, ‘s–sh’, and ‘z-zh’) (3).

"The development process is ongoing because the test-retest reliability has yet to be examined and it is unknown whether the identification performance will increase at higher suprathreshold levels."

In summary, researchers from UKM have developed the materials and preliminary psychometric functions (as shown in Figure 1) for the MFA Nonsense Word Test. The development process is ongoing because the test-retest reliability has yet to be examined and it is unknown whether the identification performance will increase at higher suprathreshold levels. It is also unknown whether the confusion between the alveolar and retroflex consonants was due to the low presentation level or the discrimination ability of the participants in distinguishing these speech sounds. Therefore, future study will focus on improving these knowledge gaps in order for the test to be applicable in clinical settings. The authors would like to thank UKM for providing funding (Geran Gerakan Penyelidik Muda: GGPM-2017-053) to support the development of the MFA nonsense word test (2, 3).

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THRESHOLD EQUALIZING NOISE TEST: AN INTRODUCTION

By Wan Syafira Ishak

In a cochlea region where either the inner hair cells (IHCs) and/or the neurons are not functioning (also known as cochlear dead regions), the information generated by the basilar-membrane vibration in that region is not transmitted to the brain (1). Nevertheless, if a test tone with a frequency similar to the characteristic frequency (CF) of the dead region is presented at a very high intensity, the tone can be detected by neurons with CFs remote from the frequency of the test tone. This phenomenon is called the off-frequency listening. Patients with cochlear dead regions may not benefit from the standard amplification protocols. Thus, identification of cochlear dead regions in patients with hearing loss deems necessary for better management. It has been hypothesized that patients with dead regions are normally those with severe to profound sensorineural hearing loss, ski-slope or reverse ski-slope hearing loss, complaints of distortion, or who have extremely poor speech discrimination test results (1).

Because of its sensitivity and reliability, a psychoacoustic tuning curve (PTC) has been regarded as a gold-standard test for cochlear dead regions. Traditionally, the PTC is measured by determining the threshold of a narrowband noise required to mask a fixed tone for several discrete masker centre frequencies. Thus, PTC testing of one ear could take up to 30 minutes to complete (2), which can be impractical in a busy clinical setting. Consequently, a new method called Threshold Equalising Noise (TEN) test has been developed with the same purpose as the PTC but offers an easier and quicker testing method (1). The main aspect of this test is to detect sinusoid tones in the presence of broadband noise in the same ear. The broadband noise is designed to produce almost equal masked thresholds as compared to the TEN level presented over a wide frequency range for listeners with normal hearing thresholds and hearing impairment but without dead regions. The rationale behind the design of the TEN noise is to prevent the off-frequency listening. In other words, the introduction of noise raises the threshold of non-tested frequencies so that they cannot respond to the signal being presented at the tested frequency.

The TEN test is currently available in audiometer, for example, the AC440 Audiometry module in the Equinox2, Affinity2 and CallistoTM. However, it also comes in a CD format where a compatible CD player needs to be connected to a two-channel audiometer with TDH 39 headphones. The detailed procedure for setting up and conducting the TEN test using the CD has been described thoroughly in Moore et al (1). For normally hearing people, the masked threshold is approximately equal to the TEN level /ERB_N. Meanwhile, the masked threshold for hearing loss patients without dead regions is usually 2 to 5 dB higher than the noise level. However, the masked threshold of patients with dead regions is expected to be markedly higher than normal (10 dB or more) because of the lack of functioning IHCs and/or neurons with CFs corresponding to the test tone frequency (1). Table 1 shows an example of the TEN test results of a patient.

	Frequency (kHz)						
	0.5	0.75	1.0	1.5	2.0	3.0	4.0
Right Ear							
PTA Threshold (dB HL)	5	5	10	20	30	45	50
TEN Level (ERB_N)$	50	50	50	50	50	60	60
Masked Threshold (dB/ERB_N)	50	50	50	50	50	62*	65*
Left Ear							
PTA Threshold (dB HL)	10	10	35	50	75	80	85
TEN Level (ERB_N)$	60	60	60	60	85	80	85
Masked Threshold (dB/ERB_N)	60	60	60	62*	98**	92**	98**

$ For PTA threshold less than 60 dB HL, it is recommended to set the TEN level at least 10 dB above the threshold or fixed level at 50 to 70 dB HL. For thresholds more than 60 dB HL, set the TEN at 10 dB above the threshold or at the same threshold level.
* Typical results obtained from SNHL patients without dead region
** Presence of cochlear dead regions

Table 1: *Example of TEN test results for a patient*

The TEN test can be used for several purposes. First, identifying dead regions using TEN test among hearing aid users may help indicate whether the users may or may not benefit from the hearing aid usage. Previous research has shown that those with dead regions benefit less from amplification than those without dead regions (3). Thus, the information may assist the audiologists to provide a more realistic expectation to the users. Second, identifying dead regions may offer extra information that helps select an appropriate amplification or fitting program. For instance, if a patient has a high frequency cochlear dead region, amplification at this frequency region may not be beneficial or, in certain cases, may cause distortion. Thus, implementing a frequency lowering technique in the hearing aid program could be a viable option. Third, information from the TEN test may be valuable in medico-legal cases, where the TEN test may indicate greater severity of hearing loss than the audiogram would suggest, such as among people with poor signal to noise ratio ability (e.g. King Kopetzky syndrome cases). Lastly, TEN test can potentially be used to indicate the presence of auditory neuropathy or retrocochlear lesion, particularly in patients who cannot tolerate loud sounds, such as during acoustic stapedial reflex or neurodiagnostic auditory brainstem response tests. For example, one study found a tinnitus patient with normal hearing thresholds but showing positive TEN results (similar pattern of TEN results as in patients with cochlear dead region). However, the Magnetic Resonance Imaging (MRI) confirmed that the patient has vestibular schwannoma on the affected ear (4). In this case, the positive TEN test results may not necessarily indicate a dead region but rather a presence of dysfunctional neurons. For cases like this, it is suggested not to rely on just one test to detect the possible pathology underlying the hearing loss, but rather to gather information from several tests for a differential diagnosis.

The purpose of TEN test

- ***May help hearing aid users indicate whether the they may or may not benefit from the hearing aid usage.***
- ***May offer extra information that helps select an appropriate amplification or fitting program.***
- ***Information from the TEN test may be valuable in medico-legal cases, where the TEN test may indicate greater severity of hearing loss than the audiogram would suggest***
- ***Can potentially be used to indicate the presence of auditory neuropathy or retrocochlear lesion, particularly in patients who cannot tolerate loud sounds, such as during acoustic stapedial reflex or neurodiagnostic auditory brainstem response tests***

In conclusion, TEN test is believed to be useful to be included in the audiology test batteries to rule out any inner hair cells and neuron damage, or retrocochlear abnormalities. Identifying cochlear dead regions in patients may help audiologists to design a specific and comprehensive management plan for patients with cochlear dead regions.

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Chapter 3
Rehabilitation & Management

MANSA
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A CLINICIAN'S DIARY: KEEPING UP WITH THE AURAL REHABILITATION TASKS

By Rosninda Abdullah, Maziah Romli & Mohd Normani Zakaria

Aural rehabilitation (AR) is intended to alleviate the difficulties associated with hearing loss and minimize all consequences by restoring or optimizing people's participation in activities that have been limited as a result of hearing loss (1). When it comes to the management of individuals with disabling hearing loss, it would be extensive. Hearing-related disability is a loss of function caused by hearing loss or inability to perform specific activities, and it is also a multidimensional phenomenon. Comparatively, the field of audiology appears to be focusing on early detection and intervention of hearing loss. At the same time, trends in AR practice continue to receive less attention. The importance of patient-centered care (PCC) was highlighted during the 4th and 5th Malaysia Audiology Scientific Conference (MASCO) events, held in 2016 and 2018, respectively, and we have heard a lot about the PCC approach since then, which was not emphasized during our undergraduate years.

In Malaysia, local audiologists would prefer the PCC approach when managing their adult patients (2). However, clinicians would continue to be in charge of appointment sessions and lead discussions. Many Clinicians are still preoccupied with biomedical needs or technocentric aspects, which frequently revolve around hearing loss and amplification devices (1,2). Subsequently, the audiology sessions may fail to address patients' main concerns, which may be in broader aspects of their listening, communication and functional well-being.

During our many years of service delivery at Universiti Sains Malaysia's Audiology Clinic, we discovered that keeping up with AR commitments is not an easy task. We juggled diagnostic tasks while also providing AR services to our patients. At the same time, we are doing our best as clinical supervisors while also completing administrative tasks. We sought AR knowledge and attempted to balance patient-contact time between technical and other psychosocial aspects of the patients' lives. The truth is that we wanted the patient and significant others to be more involved in decision making and committed with aural rehabilitation tasks such as in using and managing hearing devices, participating in counselling sessions when indicated, applying recommended communication strategies, trying environment modifications and auditory training when necessary. Otherwise, if a patient or their family is unable to commit with AR tasks, the clinician will be focusing more on the biomedical and technocentric aspects due to time limitation as the clinician also has to do supervisory tasks. After years of practice, this will be accumulated as a mixture of dissatisfaction with service delivery, frustration, and disappointment by both parties, patient and clinician.

The idea of acknowledging patients as the main focus during the clinical session will strongly promote an active involvement during shared-decision making, shared-responsibility discussion and most importantly, family involvement throughout the session. The fact that local centers did not provide adequate hearing rehabilitation options and that audiologists still focused on hearing aids and their cost rather than patients' lifestyle when following up with patients and their families are issues to consider in the near future (2). Based on our experience and observation, we believe that not all patients can make an informed decision in the clinic because they prefer a more conservative approach and trust their health professional. This is especially true when dealing with patients from low to middle socioeconomic backgrounds who lack knowledge about the audiology field.

As much as we prefer the PCC approach, it is rarely used in our daily clinical practice. That is, the traditional clinician-centered approach is still being used regularly (2). Knowing and practicing the PCC approach as the best practice in health management for adult patients will be regarded as a positive attitude in the audiology field. As practicing audiologists in Malaysia, we could begin working closely with patients to identify and address not only biomedical needs or technocentric aspects of the patients in our daily clinical service, but also biopsychosocial aspects of the patients. By taking a more in-depth history of the patient's handicapping scenarios and factors that may impede good communication outcomes, we may be able to better understand the psychosocial aspects of their life.

At the same time, we could further explore this area of expertise. It will undoubtedly be timely and

"Working with other professionals, such as a speech-language therapist (SLT), for interprofessional collaboration will be a good step toward achieving good outcomes in patients' functional listening and communication skills (2)."

require effort and support from the government especially to enforce the Allied Health Professions Act in Malaysia so that our profession and the audiologists will be acknowledged publicly. Our undergraduate years have long passed and our profession needs us to equip ourselves with good knowledge regarding the implementation of AR. The International Classification of Functioning, Disability and Health (ICF) that has been developed by the World Health Organization (WHO) expresses the consequences of a health-related condition within the context of a patient's environment and circumstances (3). The ICF addresses the nature and extent of a patient's functioning, as well as how it may be limited in the quantity and quality of daily activities due to the presence of hearing loss. As a result, any procedure we use for AR services must be in accordance with ICF.

Working with other professionals, such as a speech-language therapist (SLT), for interprofessional collaboration will be a good step toward achieving good outcomes in patients' functional listening and communication skills (2). As we want to ensure that patients get the most out of their amplification devices, we could arrange sessions with other professionals for a more comprehensive approach via group discussions or a counselling session. These professionals together with otorhinolaryngologists will be able to convey more accurate information for decision-making and assist patients in understanding the limitations and realizing better expectations through sessions with them. Accordingly, both the audiologist and the SLT should be well-versed in the provision of AR services. Essentially, universities and professional associations should play a role in organising seminars, workshops, and structured training programs for local audiologists in order to ensure more AR services are available in the future.

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FACILITATING THE INVOLVEMENT OF ADULTS WITH HEARING IMPAIRMENT AND THEIR FAMILIES IN AUDIOLOGICAL MANAGEMENT

By Akmaliza Ali

The person- or patient-centered care (PCC) approach advocates active involvement of patients and their families in healthcare management. It has been extensively promoted as a positive feature of the health management of adult patients. Given that one of the key principles of PCC is consideration of a patient's biopsychosocial needs, the PCC approach is the way to operate and apply the International Classification of Functioning, Disability, and Health (ICF) framework in clinical practice (1). Furthermore, the key elements of PCC include providing individualized care, building the clinician-patient relationship, and sharing power and responsibility. At the core of PCC is the shared decision-making (SDM) process that encourages clinician-patient collaboration in making decisions regarding patients' rehabilitation. SDM emphasizes patient participation and incorporates the patient's needs and preferences in rehabilitation decisions. Positive psychological outcomes and increased physical well-being of adult patients have been associated with SDM in healthcare, with advantages extending from a quicker recovery process, improved patient satisfaction of treatment, increased adherence to treatment plans, and greater overall patient satisfaction (2,3).

Surveys on audiologists in Australia, Iran, Portugal and India indicated that audiologists reported a strong preference for person-centred audiological management of adult patients (4,5). In Malaysia, both audiologists and adult patients believe that patients should be more involved in their audiological management. However, despite the belief in patient-centred hearing care by audiologists in Malaysia, it is not reflected in the appointment sessions. Therefore, given that adult patients in Malaysia's wish to be more involved in their rehabilitation management and that audiologists were keen on encouraging the involvement of adult patients and their families, it may be helpful if a simple guide is available for audiologists to facilitate the implementation of person-centered hearing care at their workplace.

Singh and colleagues outlined ten steps that audiologists can take to facilitate the involvement of adult patients and their families in audiological management (6). As shown in Figure 1, the steps include a specific guide for audiologists on incorporating PCC before and during the appointment sessions. Before the appointment, audiologists should extend the invitation to the family members to come along for the appointment by emphasizing why they should attend the session (6). The family member may be more compliant if they understand the reason for them attending the session. Besides that, audiologists should ensure that the room set up allows the patient and their family to be included comfortably in the consultation (6,7). Modifications such as closing doors and windows to reduce the noise entering the consultation room, installing carpet or rugs on the floor, and arranging the furniture so that the family member is not seated at the back of the room, assure an inclusive physical environment (7).

Audiologists are recommended to begin the appointment by informing patients and their families that their input will be needed in the session. This step is essential as it sets the expectation of participation from patients and their families (6). Then, audiologists should collaboratively identify the rehabilitation goals that address the biopsychosocial needs and consider the patient's and family's preferences. At this point, clinical tools such as the Client Oriented Scale of Improvement (COSI) and the Glasgow Hearing Aid Benefit Profile (GHABP) may be utilized to facilitate the joint goal-setting process (7). These tools provide a more structured and directed interview in identifying what patients and their families would like to achieve and prioritize together.

"..the key elements of PCC include providing individualized care, building the clinician-patient relationship, and sharing power and responsibility."

Once the rehabilitation goals have been established, audiologists need to provide management options to address their needs (6). Then, accurate and comprehensive information needs to be provided to patients and their families. This is to help patients and their families make an informed decision and engage in SDM when developing the rehabilitation plan (6). Furthermore, besides acknowledging that the patients and their families are the experts due to their lived experience, audiologists should always encourage family involvement in every aspect of the audiological management process. After they have experienced the rehabilitation plan, the rehabilitation outcomes for both the patients and their families need to be evaluated (6). This step is essential to assess whether the rehabilitation goals were achieved and whether alterations of the rehabilitation plan is necessary. In addition, Singh and colleagues also stressed the need to emphasize PCC principles at every management level at the healthcare facility, including the managers and front office staff. This recommendation is included to ensure that the PCC approach is fully implemented and embraced by personnel at the centre (6).

Despite audiologists in Malaysia indicating their preference towards patient-centred hearing care for their adult patients, inconsistencies were found between audiologists' beliefs and practice (8,9). Audiologists were focused on the biomedical aspects of patients, did not offer aural rehabilitation options other than hearing aids, did not engage patients in shared-decision making and gave patients' families passive roles in rehabilitation. Besides modifying how they conduct the case history by identifying personal and environmental factors relevant to audiological management, audiologists should incorporate tools that can assist them in implementing PCC in the audiological management of their patients. Tools such as the Communication Partner tools, the Time and Talk tool, and the Living Well with Hearing Loss developed by the Ida Institute were designed to help structure audiologist-patient interactions during appointments (10). The tools provide strategies for audiologists to work in partnership with patients and families to set realistic goals and establish a plan to achieve those goals.

Although most of the recommendations outlined by Singh and colleagues would not incur an extra operational cost, implementing all ten steps in one go may be challenging to an audiologist due to the varying degree of resources available at their disposal. Therefore, Singh and colleagues recommended audiologists start with the first three of the ten recommendations outlined (6). Adhering to these recommendations may increase the involvement of adult patients in Malaysia and their families in audiological management, improve their quality of life, and ultimately reduce the impact of hearing loss on the patients and their families.

1. Invite the patient's family member along to the appointment, and emphasize on the importance of them attending the session.
2. Ensure that the consultation room set up is comfortable for the patient and their family.
3. Inform the patient and their family that you will be seeking their input during the session. This step is important as it sets the expectation of participation.
4. Set goals collaboratively with the patient and their family that address their needs and preferences. May use COSI and GHABP.
5. Provide rehabilitation options that address the needs of both the patient and their family.
6. Aim for shared-decision making (SDM) when developing the rehabilitation plan. Provide accurate and complete information to facilitate the SDM process.
7. Acknowledge that the patient and their family have the lived experience and that they are the experts.
8. Encourage family involvement at all stages of the audiological management process.
9. Measure outcomes of interventions for the patient and their family. May use the Significant Other Scale-Hearing (SOS-HEAR) and the Hearing Impairment Impact–Significant Other Profile (HII-SOP).
10. Emphasize on the principles of PCC at all management levels at the healthcare facility.

Figure 1: *Recommendations for audiologists in increasing the involvement of adult patients and their families in audiological management, as outlined by Singh and colleagues (6).*

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TINNITUS MANAGEMENT FROM A MEDICAL PERSPECTIVE

By Wan Najibah Wan Mohamad & Nik Adilah Nik Othman

Tinnitus is the presence of sound in the ear without any external stimulus. The sound can be described as ringing, humming, whooshing, pulsing and many more. Tinnitus is not a disease, but a symptom of a variety of underlying conditions, such as hearing loss, head or neck injury, changes in blood pressure or metabolism, foreign objects in the ear, and injury from loud noises. Tinnitus is also a common adverse reaction to certain medications. In the majority of cases, the cause of tinnitus is unknown. Several studies, however, concluded that cochlea loss is strongly associated with tinnitus.

Tinnitus is broadly categorized into subjective (typically non-pulsatile) and objective (often pulsatile). The most common type is subjective non-pulsatile tinnitus, which is only heard by the patient. In comparison, objective tinnitus refers to sounds or noises that are audible to others as well as the sufferers, with or without the use of a stethoscope or other forms of noise amplifying instrumentation.

There is currently no objective test that can be used to confirm or grade the severity of tinnitus.

Managing patients with tinnitus is challenging, and this is due to the limited scientific understanding of the pathophysiology of tinnitus, even though the current theories suggest that any pathologic lesion along the auditory pathway or any reduction in auditory nerve function may cause tinnitus. Thus, collaboration among professionals, including medical officers, otolaryngologists, neurologists, psychologists and audiologists, is required to conduct a comprehensive tinnitus assessment that would result in informed treatment decisions. As such, clinicians evaluating patients with tinnitus should note the presence of symptoms and conditions that necessitate referral to other related professionals. Henry et al. developed a brief tinnitus triage guide to streamline the referral process and, in turn, improve patient care (1). In line with this, Tunkel et al. provide a clinical practice guideline for patients with tinnitus (2). According to these guidelines, different symptoms and characteristics of tinnitus should be referred to using different pathways. In this article, tinnitus management from a medical perspective is highlighted.

Generally, history taking and performing otoscopy guide subsequent management. Almost all patients with tinnitus should undergo audiological testing which may include pure tone audiometry, tympanometry and acoustic reflex testing. During the history taking process, questions about the characteristics of tinnitus such as the laterality and type of sound heard, and the presence of hearing loss are asked accordingly. In the case of unilateral pulsatile tinnitus, focal auditory lesions, vestibular schwannoma, or vascular tumor may be of concern and may require additional imaging findings (2). Pulsatile tinnitus is categorized into pulse synchronous (related to vascular abnormalities, arteriovenous malformation, glomus tumors and venous hums) and pulse asynchronous (related to mechanical conditions such as middle ear muscle myoclonus, palatal muscle contraction and eustachian tube contraction) (3). Additionally, head and neck masses may also cause pulsatile tinnitus. In the presence of vertigo or balance disorder, there is a possibility of retrocochlear lesions, Meniere's disease, superior canal dehiscence, vestibular schwannoma, vascular loop (involving anterior inferior cerebellar artery, AICA) or other central nervous system disorders. Meanwhile, the case of sudden onset of hearing loss with tinnitus may be treated as idiopathic sudden sensorineural hearing loss.

A full ear, nose, and throat examination, as well as neurological assessments, are required when performing physical examinations. This thorough assessment is important as positive findings may point towards the cause of the tinnitus, either in the external or middle ear, or the head and neck region. On the other hand, negative findings may guide the physician to reassure patients of the absence of sinister pathology or diagnosis.

Almost all patients with tinnitus should undergo thorough audiological assessments (pure tone audiometry, tympanometry and acoustic reflex testing) to document the degree and type of hearing loss, ear laterality, as well as to determine the possible site of the lesion and guide further audiological assessments (i.e., tone decay, auditory brainstem response etc.). In certain cases, the audiological findings may aid in diagnosing certain diseases. In Meniere's disease cases, for example, the patients would report the presence of tinnitus, hearing difficulties and dizziness. The audiological tests results might show a rising sensorineural hearing loss with type A tympanogram. In cases where unilateral tinnitus and hearing loss are present, the audiology findings may indicate the presence of retrocochlear lesion (i.e., PTA results are inconsistent with acoustic reflex findings), and a further test such as magnetic resonance imaging (MRI) is beneficial. However, when dealing with patients who suffer from hyperacusis, the high intensity sound produced by the imaging device might be intolerable to them. Other imaging techniques available for tinnitus investigation such as ultrasound of the neck, computed tomography (CT) of the head and neck region, and angiography can be employed.

"Tinnitus is broadly categorized into subjective (typically non-pulsatile) and objective (often pulsatile)."

Tinnitus is a complex condition with many potential causes and risk factors. There is no cure but there are many potential options available to assist patients in coping with their tinnitus. Tinnitus that is pulsatile, associated with unilateral hearing loss and vestibular problems, the presence of conductive pathology with abnormal otoscopic findings, and inconsistent audiological test results should be referred to an otorhinolaryngologist to rule out the underlying conditions. Certain aspects of tinnitus management associated with otological disorders (i.e., impacted ear wax or otitis media) are treatable.

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AUDIOLOGIS DAN PENILAIAN VESTIBULAR & KESEIMBANGAN

By Roshila Bujang

“Kenapa saya perlu berjumpa audiologis dan buat ujian pendengaran? Saya boleh dengar lagi”. Soalan ini seringkali diajukan oleh pesakit yang mengalami simptom vertigo yang dirujuk untuk menjalani penilaian vestibular dan keseimbangan di klinik. Pesakit mungkin keliru mengapa mereka perlu menjalani ujian pendengaran, sedangkan masalah yang dihadapi adalah vertigo atau masalah perasaan seperti keadaan sekeliling berpusing-pusing. Sebagai seorang audiologis, soalan seperti ini perlu dijawab dengan betul dan berinformasi untuk menerangkan kepada pesakit tentang keperluan menjalani ujian pendengaran dan penilaian vestibular dan keseimbangan. Ini kerana kebanyakan pesakit masih tidak jelas mengenai tujuan pemeriksaan pendengaran dan penilaian vestibular yang dijalankan oleh audiologis. Menurut Persatuan American Speech-Language-Hearing (ASHA), Audiologis adalah ahli professional yang terlibat dalam penilaian pendengaran dan keseimbangan, rawatan bukan perubatan, dan (re)habilitasi (1). Audiologis juga berperanan memberikan rawatan dalam pencegahan, pengenalpastian, diagnosis, intervensi dan rawatan pendengaran, keseimbangan, dan masalah lain yang berkaitan untuk pesakit dari semua peringkat umur. Selain itu, dari segi anatomi, kedudukan organ pendengaran dan organ vestibular berada dalam bahagian yang sama iaitu bahagian telinga dalam. Oleh itu, selain menilai fungsi pendengaran, audiologis juga berperanan menjalankan penilaian fungsi organ vestibular kerana kemungkinan masalah pada organ pendengaran juga boleh mengganggu fungsi organ vestibular. Selain itu, audiologis juga terlibat dalam pemulihan vestibular dan keseimbangan kepada pesakit yang mengalami masalah vertigo. Oleh yang demikian, peranan seorang audiologis dalam menjalankan penilaian vestibular dan keseimbangan perlu dijelaskan kepada pesakit supaya mereka faham tujuan mereka dirujuk kepada audiologis. Kefahaman mengenai fungsi telinga sebagai organ keseimbangan (vestibular) perlu disampaikan kepada pesakit bagi memahami perkaitan penilaian pendengaran dan penilaian vestibular.

Kebanyakkan pesakit yang mengalami simptom vertigo dirujuk untuk menjalani penilaian vestibular oleh Pakar Otorinolaringologi (ORL/ENT) bertujuan memastikan simptom vertigo yang dialami oleh pesakit berpunca dari bahagian telinga dalam (organ vestibular) atau masalah neurologikal. Audiologis akan menjalankan penilaian vestibular dan keseimbangan menggunakan peralatan yang spesifik dan objektif). Maklumat mengenai fungsi vestibular dan keseimbangan yang tepat seterusnya dapat membantu Pakar ORL/ENT membuat diagnosis dan rawatan yang tepat dan efektif. Walau bagaimanapun servis penilaian vestibular dan keseimbangan tidak disediakan di semua hospital. Kajian yang dijalankan oleh Khoza-Shangase et al. mendapati 81.3% audiologis di hospital awam di South Afrika merujuk pesakit untuk menjalani penilaian vestibular kepada Pakar Otorinolaringologi (ORL) (2). Ini kerana, mereka merasa tidak yakin dengan pengetahuan dan kemahiran untuk menjalankan prosedur penilaian vestibular meskipun memahami ia termasuk dalam skop praktis audiologis. Ini mungkin salah satu faktor penyebab mengapa peranan audiologis dalam menjalankan penilaian vestibular tidak diketahui oleh masyarakat umum dan profesional kesihatan yang lain. Walaubagaimanapun, kajian lain yang dijalankan oleh Nelson et al. mendapati dalam masa sedekad bilangan audiologis yang menjalankan penilaian vestibular dan keseimbangan semakin meningkat (3). Faktor kekurangan latihan yang mendalam untuk menjalankan prosedur dengan tepat dan efisien menjadi penyebab kebanyakkan audiologis tidak menjalankan penilaian vestibular dan keseimbangan. Selain itu, fasiliti yang tidak lengkap juga menjadi faktor mengapa servis ini tidak disediakan di hospital atau klinik-klinik pakar. Senario yang sama di Malaysia, dimana servis penilaian vestibular dan keseimbangan yang dijalankan oleh audiologis adalah tertumpu di beberapa hospital sahaja.

"Audiologis juga berperanan memberikan rawatan dalam pencegahan, pengenalpastian, diagnosis, intervensi dan rawatan pendengaran, keseimbangan, dan masalah lain yang berkaitan untuk pesakit dari semua peringkat umur."

Oleh itu, audiologis perlu mendapatkan latihan yang efektif dan komprehensif bagi meningkatkan kemahiran dan keyakinan menjalankan penilaian vestibular dan keseimbangan. Setiap audiologis perlu mahir memilih dan menjalankan ujian yang bersesuaian mengikut tahap umur dan keadaan pesakit. Pengetahuan yang mendalam juga penting dalam membuat interpretasi hasil ujian yang tepat. Oleh itu peluang untuk mendapatkan latihan dan praktikal yang intensif perlu diberikan kepada audiologis untuk meningkatkan pengetahuan dan kemahiran. Selain itu, fasiliti kesihatan perlu dilengkapi dengan peralatan yang diperlukan sekurang-kurangnya di hospital klinik pakar setiap negeri.

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Chapter 4
Hearing Conservation

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AUDIOLOGY STUDENTS' PERCEPTION ON THE OCCUPATIONAL AND SAFETY HEALTH [OSH (NOISE EXPOSURE) REGULATIONS] 2019

By Noraidah binti Ismail & Fatin Aqira binti Ridzuan

Prolonged exposure to hazardous noise levels at workplaces can result in noise-induced hearing loss (NIHL). Occupational noise-induced hearing loss (ONIHL) is defined as a partial or complete hearing loss in one or both ears due to prolonged noise exposure in the workplace. ONIHL was reported to be one of the most significant work-health problems worldwide. The prevalence of occupational noise related hearing disorders (ORNHD), including NIHL, hearing impairment, and Permanent Standard Threshold Shift (PSTS), shows a rising pattern from year to year. For instance, in the year 2016, 2876 cases were reported to have ORNHD among employees. Subsequently, the number of cases was slightly lower in 2017 with 2478 cases and escalated from 3907 cases in 2018 to 5699 cases in 2019 (1).

Owing to issues related to ONIHL, several preventive measures have been executed to safeguard employees at their workplace. One of the preventions that have come into force is establishing noise exposure regulations among the workers. The Factories and Machinery (Noise Exposure) Regulations 1989 was enacted mainly to safeguard workers from manufacturing, construction, and mining and quarrying sectors. Although the Acts has been executed to safeguard the workers against the noise hazard, the prevalence of ONIHL were still rising every year due to lack of stress on certain fields of the workplace. Hence, the regulations need to be updated for systematic prevention of NIHL in the workplace (2).

In view of the limitations of the Factories and Machinery (Noise Exposure) Regulations 1989, the Malaysian government under the purview of the Department of Occupational Safety and Health (DOSH), Ministry of Human Resource has enacted the Occupational Safety and Health [OSH (Noise Exposure) Regulations 2019] in July 2019. The recent legislation provides for broader coverage of employees in ten industry sectors applicable under the Occupational Safety and Health Act (OSHA) 1994. Ten sectors according to OSHA 1994 [Act 514] Schedule 1 [Subsection 1(2)] includes:i) manufacturing ii) mining and quarrying, iii) construction, iv) agriculture, forestry, and fishing, v) utilities, vi) transport, storage, and communication, vii) wholesale and retail trades, viii) hotels and restaurants, ix) finance, insurance, real estate, and business services, and x) public services and statutory authorities.

Based on the OSH (Noise Exposure) Regulations 2019, noise assessments are carried out by a noise risk assessor certified by DOSH. Audiometric testing is conducted by a trained audiometric technician and diagnosis of ONIHL is done by an Occupational Health Doctor (OHD). However, the role of audiologists was not mentioned neither in the regulations nor in the industry code of practice for management of occupational noise exposure and hearing conservation 2019 (ICOP) (3).

It is thought reasonable to investigate how far audiology students understand these regulations. A preliminary study was carried out to evaluate perception and knowledge of OSH (Noise Exposure) Regulations 2019 among final year audiology undergraduates in Malaysia. When students graduate and practice as audiologists, they must provide preventive measures to reduce the incidence of occupational hearing loss and plan an appropriate intervention to the workers who suffer ONIHL. Therefore, investigating their knowledge about Malaysia's noise regulations is essential.

A group of final year university students from three universities that offer audiology programs in Malaysia were contacted to participate in this study. The aim was to evaluate their knowledge on OSH (Noise Exposure) Regulations 2019. A set of online questionnaires was administered to the final year audiology students from International Islamic University Malaysia (IIUM), Universiti Kebangsaan Malaysia (UKM), and Universiti Sains Malaysia (USM). The questionnaire items were developed based on items in the OSH (Noise Exposure) Regulations 2019.

"When students graduate and practice as audiologists, they must provide preventive measures to reduce the incidence of occupational hearing loss and plan an appropriate intervention to the workers who suffer ONIHL."

The study showed that 100% of the students surveyed, have a good perception towards OSH (Noise Exposure) Regulations 2019. In terms of knowledge, most of them (50%) have adequate knowledge about noise regulations, its implementation, and implications. The study showed

The study showed that most of the audiology programs students understand the importance of noise regulations and why it was introduced in Malaysia. Good knowledge and understanding of the regulations, diagnosis, and management of ONIHL are important for the audiologist and the occupational health doctor (OHD) to ensure the best management and reduce the occurrence of ONIHL among workers in Malaysia.

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INSIGHTS: NEW RULES AND REGULATION OF OCCUPATIONAL SAFETY AND HEALTH (NOISE EXPOSURE 2019)

By Rafidah binti Hassan Mydin

The Factories and Machinery Act (FMA) 1967 was an act to regulate factories with regard to matters concerning the safety, health, and welfare of their employees, the registration and inspection of machinery, and other related matters. Due to the rising number of Occupational Noise Related Hearing Disorders (ONRHD) cases reported yearly, new Occupational Safety and Health (Noise Exposure) Regulations 2019 have been gazetted on 1st March 2019 and made effective on 1st June 2019 to replace FMA (Noise Exposure) Regulations 1989. This newly enacted regulation offers wider coverage of workers in ten sectors of industries applicable under the Occupational Safety and Health Act (OSHA) 1994. In order to assist industries in complying with the new law, the Department of Safety & Health (DOSH) has released the Industry Code of Practice (ICOP) for Management of Occupational Noise Exposure and Hearing Conservation 2019. The employers, employees, and occupational safety and health (OSH) practitioners can use the ICOP to learn how to recognize excessive noise, assess employees' risk towards ONRHD and adopt noise reduction measures at the workplace.
EFACE

Despite being preventable, ONRHD are the leading type of occupational diseases recorded by DOSH in recent years (1). Continuous exposure to loud and excessive noise will eventually cause permanent damage to the tiny hair cells (stereocilia) within the cochlea.

The damage will typically result in high frequency sensorineural hearing loss known as Noise-Induced Hearing Loss (NIHL). The statistical data obtained by DOSH from 2005 to 2019 showed the trend of increasing reported incidence of ONRHD. Furthermore, ONRHD became the leading occupational disease in Malaysia, which constitutes 91% of total cases recorded in 2019. This finding was supported by occupational diseases data which showed a significant yearly increment in compensation approval by the Social Security Organization (SOCSO).

The consequences of ONRHD is cumulative, causing permanent and disabling hearing loss in adults , and has resulted in over 4 million disability-adjusted life years (DALYs)(3). The consequences of ONRHD financially impact the employees, their families and the employers and cause high disease burden to the government as well. The DOSH created the Occupational Safety and Health (Noise Exposure) Regulations 2019 to meet their main objectives to minimize industrial accidents and occupational diseases by 2020. The changes in OSHA (Noise Exposure) Regulation 2019 in comparison to the previous FMA (Noise Exposure) Regulations 1989 has been simplified and outlined in table 1.

Table 1: *Comparison of new and older noise regulation from DOSH (4)*

	FMA (Noise Exposure) Regulations 1989	OSHA (Noise Exposure) Regulation 2019
Application	Applied to all FACTORIES in which persons employed exposed to excessive noise	Applied to all PLACE OF WORK covered under OSHA 1994
The need for identification of excessive noise	Needed	Determined by director general of DOSH
Assessor	Noise Competent Person	Noise Risk Assessor (NRA)
Training	Provide training for workers exposed to more than 85 dB(A)	Provide training for workers exposed to excessive noise
Training frequency	Once every 2 year	Every year
Need of assessment	No assessment towards control measure is implemented at site	Assessment is needed to see control measure practicability at site.
Information detailing	Outlines general information on noise control method	Detailing the information on noise control method
Term for Protecting Device	hearing protection device	personal hearing protector
Area exceed Noise Equivalent level (NEL)	Labeled as warning sign	Labeled as hearing protection zone
Audiometric testing	Provides general information on Audiometric testing program	Audiometric testing- detailing the scope of work for employer, Audiometry testing centre (ATC), and Occupational Health Doctor (OHD)
Registration of Audiometry Testing Centre(ATC)	Not required	Required
Fine	Not exceeding penalty of RM1000	Not exceeding penalty RM10,000 or imprisonment for a term not exceeding 1 year or BOTH
Exposure limit	Permissible exposure limit (PEL): ≥90 dB(A), >115 dB(A)max,>140 dBpeak	Noise exposure limit (NEL): >85 dB(A), >115 dB(A)max,>140 dBpeak
Action level	85 dB(A)	82 dB(A)
Exchange rate	5 dBA	3 dBA

Table 1 (cont): *Comparison of new and older noise regulation from DOSH (4)*

	FMA (Noise Exposure) Regulations 1989	OSHA (Noise Exposure) Regulation 2019
Audiometric repetition	6 months	3 months
NEL	≥PEL/Heairng impairment/Standard threshold shift: Yearly ≥AL & < PEL : Twice yearly	Annually
Audiometry report submission	No time line	1 month from the date of testing
Audiometry screening questionnaire	Not provided	Provided to determine fitness and other factors that affect result/finding
Audiometry (testing frequencies)	0.5, 1, 2, 3,4,&6 kHz	0.5, 1, 2, 3,4,6 & 8 kHz
Audiometry interpretation	Done by Medical officer in cases of permanent standard threshold shift (PSTS)	Done by OHD for all cases/ audiogram findings and any referral if needed
Notification to DOSH	For employee with PSTS	For employee present with NIHL, HI, PSTS by OHD and employer

The current regulatory requirements for the management of workplace noise have many improvements. The focus on detailed audiometry assessment is a vital recognition in accurate diagnosis of NIHL. Audiologists should be attentive to this new enforcement as they are directly involved in the diagnosis and counselling process of NIHL in their own clinical setting.

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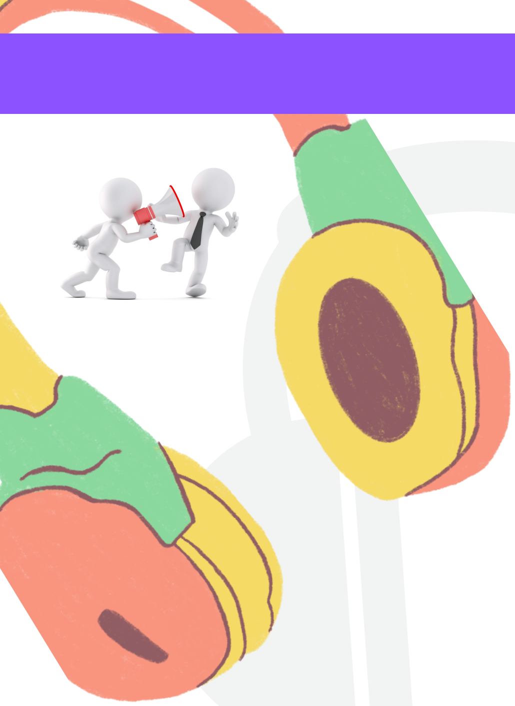

NOISE INDUCED HEARING LOSS

By Gladys Ooi Hui Ting

Many young adults in Malaysia are still not aware about the consequences of Noise-Induced Hearing Loss (NIHL) and the correct prevention method in tackling this issue. In this article, I would like to shed some light on what may cause NIHL, and the dire consequences that come with it. At the same time, I will also propose some relevant and useful suggestions in order to nip the trouble in its budding stages.

NIHL is the damage to the sensory hair cells located in the cochlear which will develop as the result of exposure to above a given level of noise and experienced over a sufficient duration of time (1). In this epoch, humans are able to produce a massively intense level of sound as a by-product of industrial activity, transportation and leisure activities such as rock concerts, club and party. The noise produced by these activities are very intense and will persist for a long period. Research from Henderson et al. showed that the noise exposure among young adults to loud noise had increased from 19.8% in 1988-1994 to 34.8% in 2005-2006 (2).

NIHL is generally classified as noise-induced temporary threshold shift (TTS) and noise-induced permanent threshold shift (PTS) (1). TTS is a type of hearing loss that can recover after a period of resting time, whereas PTS are irreversible. Moderate exposure of noise in a short period may initially cause TTS, which may fully recover within 24 - 48 hours (3). Nevertheless, continuous noise exposure will lead to PTS. In the early stage of developing the NIHL, the primary site of lesion is the outer hair cells (OHCs), resulting in a moderate hearing loss which typically affects between 3,000 Hz and 6,000 Hz. With a further long duration of exposure, the hearing loss extends to lower and higher frequencies, and degrees of the hearing loss may be greater than 60 dB. Currently, there is no effective treatment available to regain the hearing ability following the PTS because once the hair cells are damaged, they do not regenerate. Hearing loss has a profound impact on the quality of life of an individual. The aftermath of NIHL is the social handicap resulting from communication interference and various adverse outcomes such as depression, fear, embarrassment, loss of self-esteem, friction in relationships, and stigma (3).

Prolonged exposure to loud noises will lead to gradual hearing deterioration. It is difficult to be aware of the changes in hearing until the hearing loss becomes significant. It is vital to know the signs and symptoms of NIHL in order to discover it early before it escalates out of hand. The signs and symptoms of NIHL include tinnitus which is ringing or buzzing in the ear, turning up the volume of television and radio, and the speech sounds muffled. Therefore, hearing loss has a direct impact on the communication and leads to communication breakdown. If you have signs and symptoms of hearing loss, do contact any audiologist or ear nose and throat (ENT) doctor for a hearing assessment and consultation before the problems become worse.

There are a few ways that can be recommended to prevent NIHL. Hearing Protective Device (HPD) is the most effective and attainable device to be used to attenuate the external noise. Earplugs or earmuffs are usually used by those who are consistently exposed to loud noise. Currently, HPD technology has advanced substantially which can provide various levels of attenuation depending on the external exposure level. Many will question if wearing HPD will decrease their ability in normal communication with the presence of loud background noise. To solve this problem, an electronic two-way communication system is recommended for better communication among individuals in a rowdy environment without removing their HPD (3).

"Currently, there is no effective treatment available to regain the hearing ability following the PTS because once the hair cells are damaged, they do not regenerate."

In retrospect, the noise exposure among the public is surging as they tend to use electrical devices that can expose themselves to high intensity of noise. It is important to monitor the initial signs and symptoms of NIHL and seek medical assistance from healthcare professionals before it gets out of control. For the inevitable situation, HPD should be correctly used. Healthcare providers should work together with the teachers in school and the societies to promote the importance of the use of HPD in noisy environments which will help in NIHL prevention as the saying goes, “prevention is better than cure”.

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BAHAYA BUNYI BISING DALAM KALANGAN MURID-MURID DI KAWASAN PEDALAMAN: PENGETAHUAN, SIKAP DAN TINGKAH LAKU

By Wan Mohd Ashrul Wan Mahamad Lokman & Wan Syafira Ishak

PENGENALAN

Masalah pendengaran akibat bunyi hingar boleh berlaku kepada sesiapa sahaja tanpa mengira umur. Sejak akhir-akhir ini, masalah pendengaran akibat bunyi hingar dalam kalangan kanak-kanak telah mendapat perhatian daripada penyelidik daripada pelbagai negara. Ini kerana perkembangan teknologi telah menyumbang kepada peningkatan prevalens masalah pendengaran akibat bunyi hingar dalam golongan ini (1). Kini, kanak-kanak lebih mudah untuk mengakses sumber bunyi dari peranti seperti telefon mudah alih dan komputer riba. Bagi kanak-kanak di pedalaman, sumber bunyi yang menyebabkan masalah pendengaran mungkin berbeza daripada kanak-kanak di kawasan bandar. Namun begitu, kanak-kanak di pedalaman tetap berisiko untuk mendapat masalah pendengaran sekiranya terdedah kepada bunyi hingar tersebut. Masalah pendengaran ini boleh memberi kesan yang ketara kepada prestasi akademik walaupun tahap masalah pendengaran tersebut hanyalah pada tahap ringan (2). Pendedahan terhadap bunyi hingar yang berterusan sejak kecil boleh mempercepatkan proses masalah pendengaran akibat penuaan (3). Oleh itu, prevalens dan kesan masalah pendengaran akibat bunyi hingar ini boleh dikurangkan dengan program kesedaran.

Program Dangerous Decibels™ atau Desibel Berbahaya merupakan satu program berdasarkan bukti yang bertujuan memberikan kesedaran kepada masyarakat terutamanya kanak-kanak akan betapa pentingnya melindungi pendengaran daripada bunyi bising (4). Program ini telah dibangunkan oleh sekumpulan penyelidik daripada Amerika Syarikat pada sekitar tahun 1999. Tunjang utama program ini adalah untuk mengurangkan kadar prevalens dan insidens masalah pendengaran dan tinitus akibat terdedah pada bunyi bising. Pengajar Program Dangerous Decibels™ perlu mendapatkan pensijilan terlebih dahulu sebelum boleh membentangkan program ini kepada kumpulan sasaran.

Kajian lepas mendapati bahawa program ini mampu meningkatkan pengetahuan, sikap dan tingkah laku terhadap bunyi bising dalam kalangan kanak-kanak (5). Sehubungan itu, pihak Program Audiologi, Universiti Kebangsaan Malaysia (UKM) telah mengambil inisiatif untuk memperkenalkan program ini ke Malaysia. Program Dangerous Decibels™ telah diadaptasi ke Bahasa Melayu dan disesuaikan untuk masyarakat di Malaysia. Program pensijilan turut ditawarkan oleh pihak UKM bagi melatih pengajar Program Dangerous Decibels™ untuk menyampaikan ilmu berkenaan bahaya bunyi bising.

Kajian lepas di negara luar telah membuktikan keberkesanan program ini (5). Walau bagaimanapun, sejauh mana keberkesanan program ini dalam kalangan murid di Malaysia, terutamanya di kawasan pedalaman masih belum diketahui. Oleh itu, satu kajian telah dijalankan untuk mengkaji pengetahuan, sikap dan tingkah laku murid-murid di Sekolah Kebangsaan Batu Bungan, Mulu, Sarawak terhadap bahaya bunyi bising. Selain itu, jenis bunyi bising yang biasa didengar oleh murid-murid tersebut turut dikenalpasti berdasarkan temu bual bersama pelajar.

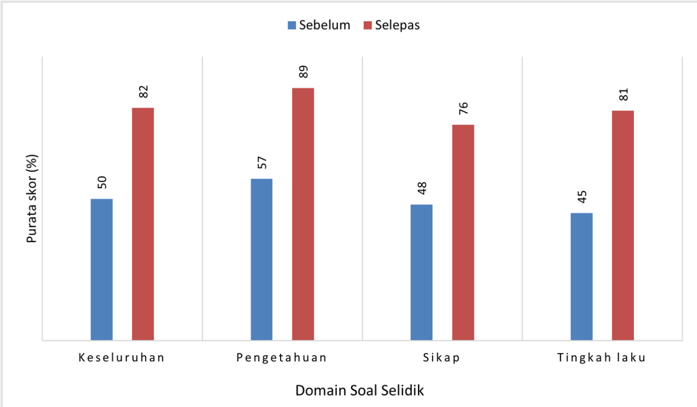
KAEDAH KAJIAN

Kajian keratan rentas ini telah dijalankan pada Februari 2020 di Sekolah Kebangsaan Batu Bungan, Mulu Sarawak. Sekolah ini terletak di pedalaman dan hanya dapat dihubungkan dengan pengangkutan udara atau air. Kajian ini melibatkan murid Tahun 5 dan 6. Kesemua peserta kajian dikehendaki menjawab satu soal selidik sebelum dan selepas program Dangerous Decibels™. Soal selidik tersebut merangkumi soalan berkenaan pengetahuan, sikap dan tingkah laku terhadap bunyi bising. Program Dangerous Decibels™ dibentangkan kepada peserta kajian selama 50 minit oleh seorang pengajar Dangerous Decibels yang terlatih dan bertauliah. Pembentangan program dijalankan secara interaktif yang melibatkan beberapa aktiviti amali bersama peserta. Program tersebut turut merangkumi tiga mesej pembelajaran utama iaitu sumber bunyi bising, kesan akibat terdedah pada bunyi bising dan tiga strategi berkesan untuk melindungi pendengaran iaitu jauhi sumber bising, perlahankan sumber bunyi dan lindungi pendengaran.

KEPUTUSAN DAN PERBINCANGAN

Sejumlah 25 orang murid yang telah terlibat di dalam kajian ini. Daripada jumlah tersebut, seramai 20 orang merupakan murid Tahun 5, manakala selebihnya adalah murid Tahun 6. Murid-murid tersebut terdiri daripada etnik Penan, Berawan, Kiput, Kenyah, Long Bawang dan Iban. Murid-murid di sekolah ini tinggal di asrama disebabkan jarak tempat tinggal dan sekolah yang agak jauh. Penggunaan bot panjang dengan enjin di belakang bot adalah kenderaan utama masyarakat di sini. Sumber elektrik bagi sekolah dan asrama adalah daripada motor penjana kuasa.

Secara keseluruhannya, purata skor keseluruhan bagi soal selidik yang dijalankan ke atas peserta sebelum pembentangan Program Dangerous Decibels™ adalah 50%. Domain pengetahuan menunjukkan skor tertinggi dengan 57% diikuti dengan domain sikap (48%) dan tingkah laku (45%). Selepas pembentangan, skor keseluruhan didapati meningkat secara signifikan sebanyak 32% ($p<0.001$), sikap sebanyak 28% ($p<0.001$)dan tingkah laku sebanyak 36% ($p<0.001$). Rajah 1 menunjukkan purata skor sebelum dan selepas Program Dangerous Decibels™ dilaksanakan bagi domain keseluruhan, pengetahuan, sikap dan tingkah laku.



Rajah 1: *Perbandingan skor sebelum dan selepas mengikuti program Dangerous Decibels™ bagi domain keseluruhan, pengetahuan, sikap dan tingkah laku*

Hasil kajian ini menunjukkan bahawa program yang dilaksanakan dapat memberikan impak yang positif kepada murid-murid. Isu kawasan pedalaman tidak membataskan kejayaan program ini kerana pengetahuan, sikap dan tingkah laku dapat ditingkatkan setelah peserta mengikuti program tersebut. Berdasarkan temubual dengan murid-murid ini, mereka kerap terdedah kepada bunyi bising di sekeliling mereka. seperti bunyi enjin bot panjang, motor penjana kuasa elektrik, dan mesin pemotong rumput.

KESIMPULAN

Secara umumnya, Program Dangerous Decibels™ ini telah berjaya meningkatkan pengetahuan, sikap dan tingkah laku murid-murid di Sekolah Kebangsaan Batu Bungan terhadap bahaya bunyi bising, masalah pendengaran dan tinitus. Program ini dapat menerapkan sikap dan tingkah laku yang baik sebagai langkah pencegahan masalah pendengaran akibat bunyi bising. Program ini turut dapat memberikan pendedahan kepada para pendidik di kawasan pedalaman dalam menyampaikan ilmu pengetahuan berkaitan masalah pendengaran akibat bunyi bising kepada murid-murid. Gabungan elemen pembelajaran dan aktiviti amali dilihat dapat meningkatkan pengetahuan, sikap dan tingkah laku terhadap bunyi bising dalam masa yang singkat. Walau bagaimanapun, sejauh mana ilmu yang diperolehi serta sikap dan tingkah laku positif tersebut kekal dalam kalangan murid-murid tersebut tidak dikaji dalam kajian ini. Oleh itu, banyak lagi kajian pada masa hadapan perlu dilakukan dalam mengkaji keberkesanan jangka masa panjang program ini. Program Dangerous Decibels™ ini juga boleh dijalankan kepada murid-murid sekolah lain bagi menerapkan konsep bahaya dan kesan bunyi bising sejak di peringkat awal lagi. Ini bersesuaian dengan pepatah Melayu yang berbunyi "melentur buluh biar dari rebungnya".

"Program Dangerous Decibels™ atau Desibel Berbahaya merupakan satu program berdasarkan bukti yang bertujuan memberikan kesedaran kepada masyarakat terutamanya kanak-kanak akan betapa pentingnya melindungi pendengaran daripada bunyi bising."

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HEARING CONSERVATION FOR MUSICIANS: AN OVERVIEW

By Tong Lee Choo

As we all know, musicians are among the populations who exposed themselves to high sound pressure levels due to their job nature. Studies showed that nearly 40% of musicians were found to have hearing loss (1). Besides, tinnitus, hyperacusis, diplacusis and distortion are also the common hearing symptoms reported by the musicians (1). It appears necessary to conduct hearing awareness programs for the musicians. However, the current programs that we have now may not be enough to cover the information that the musicians need to know.

Have you ever wondered what makes music and noise different? Noise is an unwanted sound that is usually loud and annoying, while music is pleasant to the ears and is composed of sounds with a fundamental frequency and overtones (2). We avoid loud noise in daily life, but it is not always the same for loud music. Research showed that music at high intensity has similar effects to drugs such as cocaine which can activate some regions of the brain (3). Sometimes, being loud seems to give more feel to the music. Although noise and music that exceed the safe level are both damaging to the ears, it is easier to reduce noise compared to loud music exposure as it is challenging to attenuate loud music but at the same time preserve its artistic nature (4).

Loud music affects the musicians differently even though they are from the same orchestra or band. The dosage of noise exposure is influenced by many factors such as the types of musical instruments, the position of the musicians on the stage, the duration of exposure, room acoustic and venue when performing (indoor or outdoor) (5). Some musicians experienced more severe hearing symptoms due to their position on the stage that is near to the loud instruments. Increased exposure time is also correlated to some musicians who need to practice after work and perform more rehearsals during a certain period. There is no one size fits all assumption to the dosage of noise exposure for the musicians. Hearing professionals are advised to study the population to suggest more appropriate recommendations on hearing conservation to the musicians.

Here comes the essence of the article. Following are some of the key information that I think are crucial to be included in a hearing awareness program for musicians.

1. **The early signs of hearing loss**- Musicians experienced the effects of loud music on their hearing such as recurrent temporary threshold shifts and tinnitus. However, they may not be aware that those symptoms could be the early signs of hearing loss. Therefore, explanations on hearing mechanisms and the effects of noise or loud music on hair cells should be included in the program.

2. **The loudness and the permissible exposure levels of different musical instruments**- Musicians may have no idea how loud their instruments are making. By showing some measurements to the musicians, they can easily understand how loud their musical instruments are and know when it is time for them to take a break. These help them to plan their schedule and prevent themselves from music overdose.

3. **Hearing protection strategies for musicians**- The high risk of music-induced hearing loss highlighted the importance of hearing protection behaviours when playing music. However, strategies such as walking away from loud noise or turning down the volume may not be very practical for the musicians. Recommendations for the musicians should be as relevant as possible to their jobs. For example, taking regular breaks, improving room acoustics, monitoring in-ear monitors' volume levels and using custom musicians earplugs.

4. **The importance of annual hearing review**- It acts as an excellent motivator for musicians to continue practising hearing protection strategies. It can also be used as a good tool to measure the effectiveness of a hearing awareness program.

In conclusion, musicians are unique and distinct from other populations. To provide better services to the musicians, it is essential to assess their backgrounds and needs. More studies on their hearing symptoms, working environments and hearing protection behaviours should be conducted in Malaysia. It may help in designing a more effective hearing awareness program for this group

"The dosage of noise exposure is influenced by many factors such as the types of musical instruments, the position of the musicians on the stage, the duration of exposure, room acoustic and venue when performing (indoor or outdoor)."

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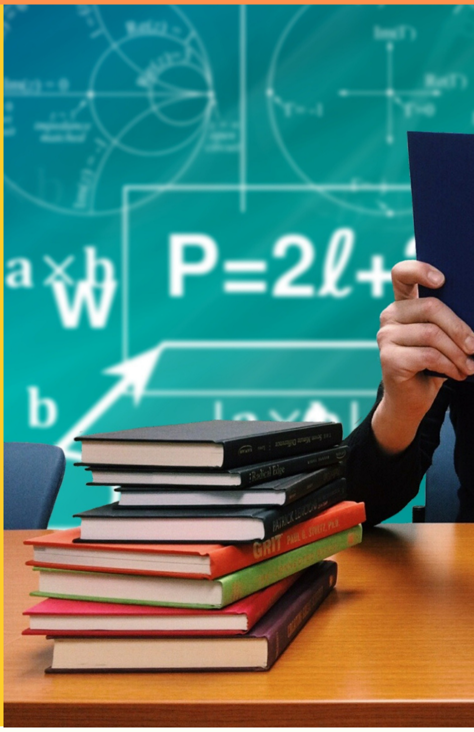
Chapter 5
Teaching & Learning

MANSA
Malaysian National
Society of Audiologists

PRESERVING ACADEMIC QUALITY IN CLINICAL AUDIOLOGY DURING COVID-19 PANDEMIC: UNIVERSITI SAINS MALAYSIA (USM) EXPERIENCE



By Mahamad Almyzan Awang, Mohd Fadzil Nor Rashid, Wan Najibah Wan Mohamad & Mohd Normani Zakaria

The Coronavirus disease (COVID-19) pandemic is still ongoing, and recent data on COVID-19 cases with the Delta variant shows spikes and concerning figures. Moreover, as this article is being written, the number of vaccinations among the general public, including university students, is increasing in order to reduce the negative consequences of COVID-19 infections. The impact of this pandemic can be seen in almost every aspect of our lives, including the teaching and learning processes in higher education institutions around the world.

To meet all requirements, the Audiology Programme at Universiti Sains Malaysia (USM) underwent rapid modifications and transformation. In particular, adaptation and assimilation of conventional procedures into the new Standard Operating Procedure (SOP) involving teaching, practical, clinical hands-on and assessments of learning process was carried out with continuous improvements, in line with the changes of Movement Control Order (MCO) stages announced by the government (1). Since the implementation of MCO in 2020 last year, two batches of audiology students have successfully completed their studies.

In general, it is known that in order to control the spread of COVID-19, we need to maintain social distance, wear facial masks, and always wash our hands. As such, in the Audiology Programme, all teaching activities were conducted online, either through the Webex platform or other teaching platforms that are convenient for the students and lecturers. These online activities include discussion sessions as well as presentations by students, such as clinical case presentations or group presentations. Having the online classes may appear simple, but internet interruptions necessitate lecturers to have a backup plan in place when organising these activities.

The teleaudiology approach was introduced for clinical practicums including audiometer simulation (AudSim) task for masking training. This method allows students to access the AudSim software in the clinic from any location as long as they have an adequate internet connection. Consider how students will practise completing all masking requirements through this practical within a specific time frame while performing this task far away from USM

Kubang Kerian. Fortunately, with the ongoing assistance of our own staff members, we were able to assist students in completing a series of AudSim tasks as outlined in the teaching and learning plan. As a result, students would feel more confident performing audiometric tests in real clinics after receiving adequate AudSim training.

Accordingly, clinical hands-on students were scheduled to perform routine audiology assessments on adults and paediatric cases in accordance with special SOP (2). While attending patients in the clinic for face-to-face sessions, students must wear a white coat, face mask, and facial mask. In addition, students and patients must fill out a COVID-19 declaration form and measure their body temperatures each time they visit the clinic. The room and toys used for paediatric cases must also be sanitised immediately following each clinical session and the room will be left open for half an hour for ventilation purposes. Aside from that, the total number of people in the clinic at any given time is limited to abide by the infection control recommendations. For example, when a procedure is being performed, no more than four people are permitted inside the testing room (i.e., patient, spouse/parent, student, and clinical supervisor).

When it comes to clinical examinations, which include OSCE and long cases for real-life individual assessments, some changes were made to reduce the risk of COVID-19 spread. Face-to-face assessments were carried out without jeopardising COVID-19 prevention SOP and OSCE quality assessment. There was a break between assessment rotations to give time for the ventilation and sanitization process. The teleaudiology approach was used again during the clinical examinations. It is critical to position a camera and video recorder in the correct location in order to provide a complete view of the real-time session.

"While attending patients in the clinic for face-to-face sessions, students must wear a white coat, face mask, and facial mask."

Having this optimum setting enables the examiners to view students' performance without staying inside the clinical room. Even during this examination, one of the examiners had to stay in KL due to an emergency. Fortunately, she was also able to contribute and comment on students' clinical skills during this exam.

In conclusion, COVID-19 gives us all nightmares because no one knows how to deal with its consequences. Nevertheless, with a good spirit of teamwork and understanding among all staff members, we were able to limit the effects and do our best to meet all of our stakeholders' expectations.

At the very least, we were still able to produce new young graduates in our field who will join the service force and provide the best services to the community. We feel that all newly graduated students have met the minimum qualifications to practise as an audiologist given their performance in all examinations including the face-to-face clinical assessments. Although some amendments to the teaching and learning process have been made to combat the influence of COVID-19, the respective Malaysia Quality Assurance (MQA) standard has never been compromised (3).

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CLINICAL TRAINING FOR THE AUDIOLOGY STUDENTS OF INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA (IIUM) DURING THE COVID-19 PANDEMIC: THE CHALLENGES VS. OPPORTUNITIES

By Sarah Rahmat, Nurul Syarida binti Mohd Sakeri, Raihana binti Rosli, Muhammad Rizal bin Marsudin, Nur Hamizah binti Othman, Noor Afzarini Hasnita binti Ismail & W. A Wan Aslynn.

The COVID-19 pandemic has undeniably caused a huge impact on how education is being delivered including the clinical training for Audiology students in IIUM. Going through this pandemic, the Department of Audiology & Speech Language Pathology (DASLP), IIUM has adapted and devised several methods to help with the students' clinical training, which includes Tele-Audiology services, virtual external clinical placement, simulated online clinic, online clinical observation and virtual clinical examination. In this paper, we reflect upon the challenges faced and how they were turned into opportunities.

Tele-Audiology services

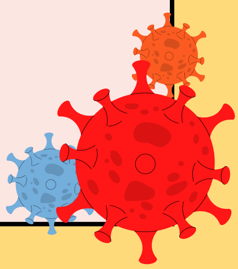
To control the spread of the COVID -19, the new standard operating procedure (SOP) for the IIUM Hearing and Speech clinic was introduced. The SOP is designed to observe the 3 W 3 C components (Wash, Wear, Warn, Crowded, Confined, Closed Conversation).

As such, the number of patients coming to the audiology clinic was reduced to 60% from the normal operation to allow for the sanitization process in between patients. This reduction has somehow affected the amount of clinical training that can be offered to the students. Hence, a tele-audiology service was introduced. The clinical session was conducted virtually via an online meeting platform. During the tele-audiology clinical sessions, students learned how to set up an online platform that is convenient to all parties (especially to the patients), to communicate effectively with the patients, and to come out with alternative troubleshooting techniques should patients have any concerns or issues. In our opinion, this service should be continued in the future as it would benefit the patients greatly, (particularly those who need urgent attention) as well as the students (as they learn a new way of providing services despite the limitations to conducting physical sessions).

Virtual external clinical placement

Apart from the clinical placement in IIUM Hearing and Speech Clinic, students were also assigned for clinical placement at the Ear, Nose & Throat (ENT) clinic, Sultan Ahmad Shah Medical Centre, IIUM for face-to-face clinical sessions. While we are grateful to have various settings for clinical trainings; they were still insufficient to cater the needs of students' clinical training as well as their clinical hours. Hence, external clinical placement is needed. Unfortunately, during the Movement Control Order (MCO), there were a limited number of external hospitals and clinics that can offer physical supervision (as they need to abide by their own SOP). To make matters more challenging, the students' movement for interstate or inter districts were also limited during MCO. These challenges were turned into opportunities when the DASLP managed to collaborate with various external hearing aid centers & audiology clinics to offer virtual external clinical placement across the states.

Going through this pandemic, the Department of Audiology & Speech Language Pathology (DASLP), IIUM has adapted and devised several methods to help with the students' clinical training, which includes Tele-Audiology services, virtual external clinical placement, simulated online clinic, online clinical observation and virtual clinical examination



Together with the training they received internally and the virtual placement, students gained clinical experiences in different settings which included hearing aids and cochlear implant settings. This process has taught us that the effort to shape our future audiologists was not merely contributed by the DASLP, but it was a result of the collective responsibility by Malaysian audiologists nationwide. Thank you!

Simulated online clinic

There was a period during MCO 2.0 where there was a great surge in the number of Covid-19 cases. It totally halted our clinic's operation, which could have affected the clinical training if prompt action was not taken by the department. As an alternative, we initiated the simulated online clinic. The simulated clinic sessions were conducted via the Google Meet platform under the supervision of the Audiologists. The students were required to share their screen while conducting audiological testing (via Audiology clinic simulator software) and attempt the clinical session as they would normally during a physical clinic. The introduction of simulated online clinics was one of the efforts to preserve the quality of the Audiology clinical training for the students despite the limitation of the physical clinic that they can attend. This effort was in line with the implementation of the simulated clinical training for Audiology students in other countries, which was proven effective (1).

Online clinical observation

Previously, two groups of students were allowed in the clinic. The first group was the students who were directly involved in the clinical session as the tester), and the second group was the observation group (they observed the session conducted by the first group).

After the session, both groups were involved in the discussion with the supervisors. As to abide by the new SOP for crowd control, the observation session was done online. This decision was made in order to limit the number of people in the clinic at any given time. The clinical session was recorded via an action camera placed on the shoulder, or on the head strap of the student who was the tester during the session, or on the tripod (refer to Figure 1). A consent to record the session was obtained from the patient prior to the recording, and the confidentiality of the patient was ensured throughout the process (i.e., no recording shall be kept in personal computers, and shall not be distributed elsewhere). The video recording was then uploaded into a secured google drive which was later made available to all students. This recording enables the observation group to watch the session from their own monitors. Through this practice, not only the session benefits the students under the observation group but also to other students who have the opportunity to learn different cases as these recordings are accessible by them.

Virtual clinical examination

The challenge continued with regard to assessing the clinical competency of our students. Traditional clinical examination using real patients was not possible as the clinic was not allowed to operate, and it was also a difficult time to get patients. As an alternative, the virtual clinical examination was introduced. This exam was a live online session, where the students needed to perform all the basic routine testing, i.e. from history taking until explaining results and providing feedback to the patient. Students were required to share their screen with the examiners to show their techniques in obtaining the hearing threshold of the case. Different cases were prepared appropriate to the aims of each of the clinical courses. Though it was a different medium of examination, the assessments were able to assess the performance of the students, almost thoroughly. The DASLP also had the opportunity to invite an external examiner for this exercise. We received positive feedback on this alternative way of assessing the clinical competency of the Audiology students.

"The SOP is designed to observe the 3 W 3 C components (Wash, Wear, Warn, Crowded, Confined, Closed Conversation)."

Despite all the challenges and the change to the method of delivery for the Audiology clinical training, the Malaysia Quality Assurance (MQA) standard was always maintained to its highest standard (2). The lessons learned by the DASLP, IIUM from this pandemic with regard to the Audiology clinical training are very valuable: We are ready to face the new challenges; we turn the challenges into opportunities to explore and grow; and together we survive and succeed. Despite the negative impact of the COVID-19, as Muslims, in general, we shall believe that every disaster created by Allah should be viewed as an opportunity for us to learn and progress (3):

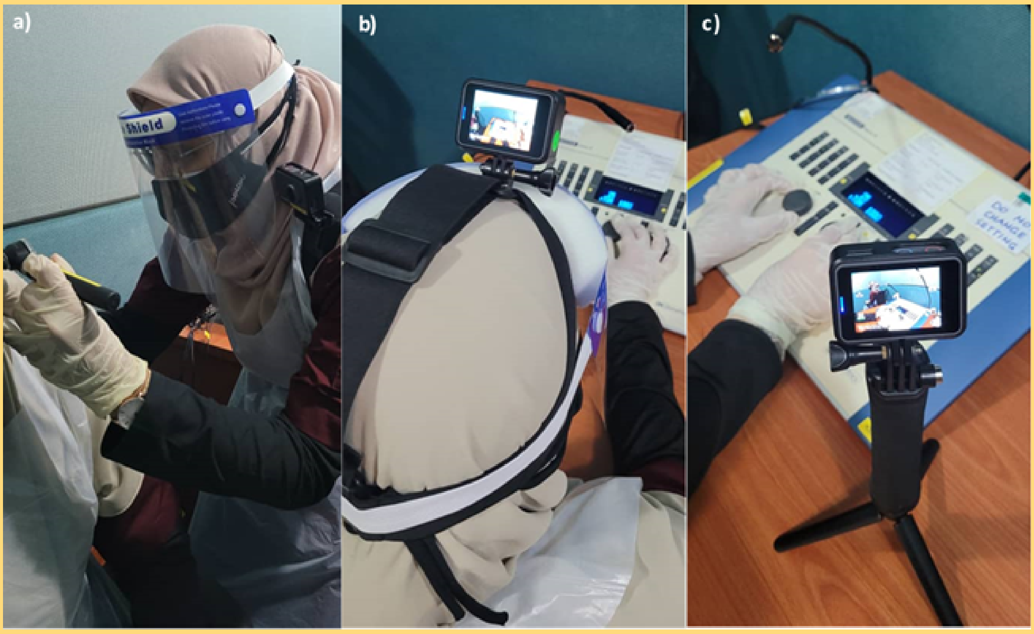


***Figure 1:** The setting for clinical recording via an action camera ; a) placed at the shoulder, b) placed on the head strap of the student who was the tester for the session, c) using a tripod*

"Men who celebrate the praises of God standing sitting and lying down on their sides and contemplating the (wonders of) creation in the heavens and the earth (with the thought): "Our Lord! not for naught hast Thou created (all) this! Glory to thee! Give us salvation from the penalty of the fire." (Chapter 3: 191).

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ONLINE CLINICAL EXAMINATIONS FOR FINAL-YEAR AUDIOLOGY STUDENTS DURING THE COVID-19 PANDEMIC: EXPERIENCE FROM THE AUDIOLOGY PROGRAMME, FACULTY OF HEALTH SCIENCES, UNIVERSITI KEBANGSAAN MALAYSIA

By Chong Foong Yen, Nur`Izzati Md. Yusoff, Akmaliza Ali, Wan Syafira Ishak, Rafidah Mazlan, Marniza Omar, Wan Nur Hanim Mohd Yusoff, Nadiah Abd. Aziz & Mohd Khairil Azahar Jamaluddin

Malaysia has been battling coronavirus disease (COVID-19) since the year 2020 (1). Due to the outbreak, a series of movement control orders have been implemented in Malaysia since 18th March 2020. Like other tertiary education programs, the Audiology Programme of Faculty of Health Sciences, Universiti Kebangsaan Malaysia (UKM) adheres strictly to the standard operating procedures (SOPs) that are in place for all education institutions in Malaysia. These SOPs have led to the surge in the use of technology in teaching and learning (TnL) that requires a different pedagogy. As such, online classes or examinations have become the primary mode of TnL. Previously, clinical examinations were conducted in the audiology clinic with the presence of actual patients. To adhere to the SOPs, clinicians and academicians of the UKM Audiology programme have taken up the The online clinical examinations were conducted twice (in Semester 1 and 2 of the 2020/2021 academic year) using the Microsoft Teams platform. To ensure standardization among simulated patients (i.e., the examiners), three simulated cases were created (Case 1, 2 and 3) and used for the online examination. Materials including case history forms with mock patient information, audiograms, and immittance test results were derived from patients' case record at our clinic, without disclosing the patients' identity such as name and date-of-birth.

On the day of the examination, seven concurrent break-up rooms were created, with two examiners and a maximum of three students assigned to each room. Each examiner took turns to act as a simulated patient during the examination. A schedule was prepared to indicate the order of students being examined. Seven students scheduled in the first examination session were evaluated using Case 1 concurrently, while another seven students scheduled in the subsequent session were evaluated using Case 2 concurrently, and so forth. Each student was required to perform case history taking, pure tone audiometry (PTA) testing, and feedback on the simulated patient within 40 minutes.

During the examination session, the simulated patients would answer the case-history questions based on the information provided in the case history form. Then, the students used an online PTA simulator (2) to simulate PTA testing. The online PTA simulator has a 2-channel display, whereby channel 1 delivered pure tones and channel 2 delivered narrow-band-noise for masking procedures. Each channel has the up-down arrows (in 5-dB steps) to simulate the attenuator of an audiometer, as shown in Panel A in Figure 1. During the simulated PTA testing, the students were required to share their screens with the examiners and the simulated patients indicated their responses to the tones presented based on the audiograms of the simulated cases. After completion of the PTA testing, the examiners would display the immittance results to the students. Next, the students were required to provide feedback (i.e., provide test results, diagnosis, and management) to the simulated patient. Once the 40-minute examination period had elapsed, the students were given 10 minutes to prepare for their clinical viva. The viva sessions were conducted for 30-40 minutes to assess students' understanding of the case, their ability to answer questions and critical thinking skills.

Despite the fact that audiological simulation training and examination is still in its infancy worldwide, several advantages of the online clinical examination approach have been identified. Firstly, this approach prevented the risk of COVID-19 infection among students and staff and reduced the risk of spreading COVID-19 by eliminating patients' need to travel into the clinic to become test subjects. Secondly, since the students had to treat the examination process as if they were receiving new patients, the evaluation reflected their clinical skills because they had to conduct basic assessments within a given time. Thirdly, the students had a preliminary experience to explore tele-audiology practice, which is on the rise due to the pandemic. Moreover, several virtual examination rooms were utilized concurrently and eliminated the need for coordinating physical testing rooms. Lastly, implementing an online examination was cost-saving as perishable items and patient-related costs such as travelling time, the need to apply for leave from work and arranging for child care were greatly reduced.

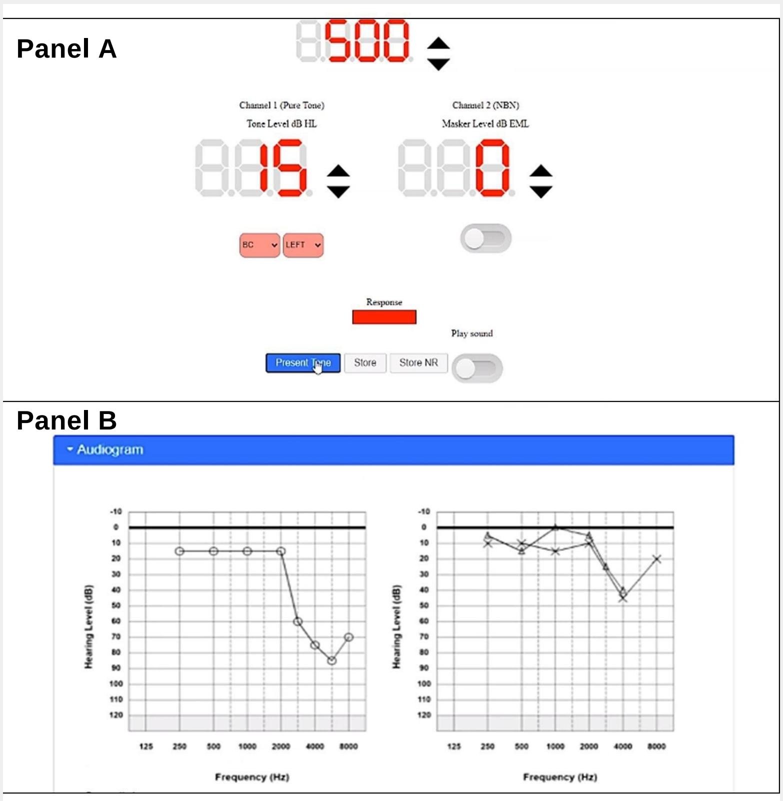

Figure 1: *An example of screen sharing during the simulated pure-tone-audiometry (PTA) testing. Panel A shows the display of the online PTA simulator. The simulated patient responded by providing verbal response according to the pure tone presentation indicated on the screen (i.e., when the student clicked on the "Present Tone" button). Panel B shows the on-screen audiogram after students have obtained the PTA test results.*

Although many advantages were observed, limitations to this approach were acknowledged, including the lack of assessment of students' competency in managing pediatric cases due to the difficulty involving pediatric patients and the lack of evaluation in conducting immittance testing, as well as other hands-on skills such as headphones placement. Despite these limitations, we have successfully conducted the clinical examinations for audiology students using an online approach. Our clinical educators will continue to refine the online examination approach to improve our evaluation of the student's clinical ability and implement a more comprehensive and robust clinical assessment in the future.

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Advantages of the online clinical examination approach

- ***Prevented the risk of COVID-19 infection among students and staff and reduced the risk of spreading COVID-19***
- ***Evaluate student clinical skills***
- ***Experience to explore tele-audiology practice***
- ***Cost-saving***

IMPACT OF COVID-19 TOWARDS LEARNING: INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA (IIUM) AUDIOLOGY STUDENTS' PERSPECTIVE

By Ain Nadthirah binti Ahmad Suhaimi, Ayu Azira binti Amat & Ayu Madiha binti Hanafi

INTRODUCTION

At the end of 2019, worldwide were shocked by the emergence of a dangerous disease known as Coronavirus (COVID-19). The number of cases keeps increasing worldwide, and Malaysia recorded 1,384,353 total cases in mid August 2021 (1). These viruses cause big impacts on all sectors including the economy, social, health and also education. This article aims to highlight the impact of COVID -19 on the education sector specifically for audiology students from International Islamic University Malaysia (IIUM) .

CHANGES IN LEARNING SITUATION DURING THE PANDEMIC

i) Mode of Learning

The lectures were mostly pre-recorded and distributed to the students via an online platform according to the class schedule. On top of that, there are virtual sessions for students and lecturers to meet up on online platforms such as Google Meet, Zoom and Microsoft Team. For clinical learning, the conventional method was modified by including the use of Parrot Software which is mainly used to practice basic routine tests of audiological assessment. Hence, blended methods of learning were implemented despite the current situation.

ii) Academic assessment

Due to COVID-19 pandemic, there is a restriction in terms of patient's attendance and the number of clinical students involved per session. This is because of new standard operating procedures (SOP) that need to be adhered. In this current pandemic, one hour is allocated after each clinical session to sanitize the setting which reduces the contact hour available for the audiology students. Most assessments that involve physical contact and group assembly have been modified to online assessment and virtual settings. For instance, the practical assessment could not be conducted as the advanced audiological technologies were not accessible by students during the Movement Control Order (MCO).

CHALLENGES FACED DURING THE PANDEMIC

i) Adaptation to the current situation

Much effort is needed in order to adapt to the current situation. Besides virtual and online learning being introduced, students need a good internet connection and well-operated devices to ensure they can participate in class.

ii) Modification of academic plan
During our final year, the Department of Audiology and Speech-Language Pathology (DASLP) planned to combine Audiology Clinic 3 and Audiology Clinic 4 in one semester. This modification is done to help final year students to graduate on time. Some might find it challenging to cope but the DASLP also provides other options to help those who struggle by allowing students to drop one of the clinical subjects.

iii) Limitation to simulation case
After the MCO was announced, clinical sessions were halted. We were encouraged to practice Pure tone audiometry and Impedance audiometry using Parrot Software installed on the laptop. This software only enables users to conduct testing limited to simulated patient, not on real-patient. While the exercise could help maintain the audiology technical competency, other soft skills might need further assistance.

ADVANTAGES ENCOUNTERED DURING THE PANDEMIC

i) Enhanced Digital skills
One of the challenges during this pandemic is online learning. It cannot be denied that while the students are developing knowledge and skills in audiology, digital skills are also sharpened. Students' ability to explore technology, and digital revolutions improved due to the use of online learning tools and technology such as online tests, online platforms mentioned and virtual simulation training.

Changes in learning situation during the pandemic
- ***Mode of Learning***
- ***Academic assessment***

Challenges faced during the pandemic
- ***Adaptation to the current situation***
- ***Modification of academic plan***
- ***Limitation to simulation case***

Advantages encountered during the pandemic
- ***Enhanced Digital skills***
- ***Developed self-discipline and coping mechanism***
- ***Strengthen the Ukhuwah***

ii) Developed self-discipline and coping mechanism
The exciting part of the online learning is that the students have access to the pre-recorded lectures at their own available time. Thus, there would be no distraction and the pacing of the lessons would be based on the students' comfort level. This requires good self-discipline as the students can manage their own schedule and be consistent in improving their knowledge of the coursework. Indeed, there could be some students who might not be persistent at all times in these uncertain situations. This pandemic affected each student in different ways. Nevertheless, students nowadays have shown incredible effort to develop their own coping mechanisms to encounter the inevitable situation.

iii) Strengthen the Ukhuwah

Instead of online distance-learning, students taking audiological clinic courses also had their practices at the audiology clinic in Sultan Ahmad Shah Medical Centre with a strict standard of procedures. The health and well-being of students were highly observed and prioritized by the DASLP. To illustrate, the DASLPt organized food distribution for the students who stayed on campus during Eid al-Fitri as shown in Figure 1. The warm and considerate gestures shown by the DASLP had strengthened the bond between each of the students and the DASLP members.

Figure 1: *The Department of Audiology and Speech-Language Pathology (DASLP) distributed Eid dishes.*

CONCLUSION

In conclusion, this pandemic gives new experiences to all students by providing several advantages and disadvantages. This pandemic should not be a reason for the students to give up, as we need to look forward and try to adapt to this situation. The system of education should be modified to suit the current situation. We also hope that the requirement for students to graduate should be improvised and the teaching mode should be more flexible and suit the current situation.

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VITALITY OF SOCIAL NETWORKING IN AUDIOLOGY

By Vivekanandh Mathiyalagan

The article focuses mainly on the benefits of social networking as a third-year student in the Audiology field from the National University of Malaysia (UKM) and its impact on professional development in the future. Speaking about the benefits of socializing, some can be highlighted, such as building strong leadership skills in an early stage, interconnecting global experience with the Audiology field, and accepting various perspectives from an international or local platform for a better room for improvement. Globalization can be defined as an interconnection of people and businesses across the world that leads to global cultural, political, and economic integration (1).

First and foremost, I would like to begin my story by sharing on how my leadership skills and self-confidence level have increased. I expanded my wings via meeting international people when I was chosen as the UKM ambassador by the UKM GLOBAL team. I was also one of the Student's Executive Council of my residential college, holding the portfolio of Innovation & Research. Through this position, I enhanced my leadership skills when I organized an international event called the Healthcare & International Culture Explorace (HICE). As the director of the event, I faced many objections and criticism initially as it was the first international event and I have learned how to accept multiple views from different people in a professional manner. Being a part of the organizing team gave me the opportunity to work with other students from different courses and at the same time developed me in being more systematic in conducting an event..

Secondly, I created the room for improvement for the event by thinking out of the box in constructing creative online activities for the participants. I learned how to consider multiple ideas and suggestions and to vision the future of the event by being a good decision-maker. Participants from around the world had joined the event such as from Malaysia, Egypt, Indonesia, India, Poland, United Arab Emirates, Philippines, Japan, United Kingdom, Vietnam, and China. In total, the program was a huge success with 570 participants enrolled in this event. Having such an eye-opening experience has made me well equipped to organize international Audiology conferences or to be a hearing aid brand ambassador for any hearing aid company in the future.

Apart from that, I would encourage my readers to participate in global events as one of the ways to broaden our horizons and to be beneficial to others during this pandemic. Globalization on higher education has several impacts such as allowing students to obtain new methods on working culture, to experience different cultural impacts on activities organization, to enhance students' language and harmony skills in different cultures, to develop multi-sided thinking by causing them to gain cultural sensitivity and finally to teach on how to behave according to cultural differences (2). This eventually leads to my final point which is to interconnect global experience with the Audiology field. For instance, while working for theAsian Undergraduate Summit (AUS) event, I learned a lot about different cultures from students coming from various countries

such as Singapore and Philippine. From the experience, I learned how to alter the program's structure to achieve harmony and equality for participants from all nations. I also can relate with the importance of cultural competence from the experience and as a future audiologist, I can accept and respect other working cultures from different countries too.

As a student, I strongly believe that globalization would be the key to leadership and applying it to my profession by being exposed to multiple work cultures, developing my professional communication skills, and implementing new ideas for a better room for improvement. As an audiologist, I can grow my clinical skills by understanding my patients' needs from different backgrounds and considering all the etiologies in providing the best treatment for them too. Spreading awareness of hearing and balance impairment to society would also be another astonishing positive impact of me being socially active. Professional communication would intensify me to build a good rapport with my patients and to have greater trust from my employer too.

In a nutshell, 'the internet is becoming the town square for the global village of tomorrow' is a quote by Bill Gates which I highly embrace since every one of us have the opportunity to be globalized and to deeply understand the vitality of social networking by making good use of the virtual world and to be someone worthy and precious for the community.

"Globalization on higher education has several impacts such as allowing students to obtain new methods on working culture, to experience different cultural impacts on activities organization, to enhance students' language and harmony skills in different cultures, to develop multi-sided thinking by causing them to gain cultural sensitivity and finally to teach on how to behave according to cultural differences."

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MANSA

Malaysian National Society of Audiologists