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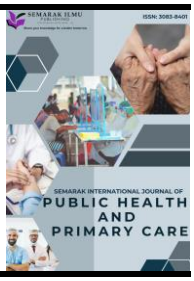


# Translation, Adaptation, and Integration of the Automated Method for Testing Auditory Sensitivity (AMTAS) Instructional Video in Malay

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**ABSTRACT**

The growing demand for hearing healthcare services in Malaysia, aggravated by a shortage of audiologists, underscores the need for alternative solutions like automated hearing assessment tools. The Automated Method for Testing Auditory Sensitivity (AMTAS), a widely recognized system internationally, has not yet been adapted for use in Malaysia. This study aimed to translate and validate the AMTAS instructional video into Bahasa Malaysia, enabling its application among the local population. The verbatim translation approach ensured word-for-word accuracy to maintain instructional integrity. The translated content was incorporated into the AMTAS system, providing clearer instructions for Malaysian users. The methodology involved a multi-step process: transcription of the original video, translation into Malay, and final review by language experts. Results indicated that the Malay version of the instructional video improves accessibility, leading to enhanced user comfort and response accuracy. This initiative addresses the language barrier in hearing assessments and contributes to expanding AMTAS usability in Malaysia. In conclusion, the translated video can facilitate better hearing assessments, particularly in rural and underserved communities, potentially improving audiology services nationwide.

## 1. Introduction

The rising number of individuals with hearing loss outweighs the number of audiologists serving the population with hearing healthcare services [1]. A Malaysian online survey by Statista Research Department in 2018 asked individuals about the frequency of their visits to audiologists. According to data, about two percent of Malaysian respondents claimed to visit or consult with hearing specialists at least three times a year, while about 61% said never to visit an audiologist [2].

Audiologists, who are health care professionals, are essential in raising awareness and increasing community access to hearing health care and support [3]. Goulios and Patuzzi [4] reported in a survey overseeing audiology services in 64 countries worldwide that 86% of respondents indicated

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insufficient audiologists were available to meet community needs. The increasing demand for hearing services in overcrowded clinics and remote areas, coupled with challenges in training more audiologists and issues related to remote living, highlights the problem of under-servicing [4].

In Malaysia, as of 2023, nearly 800 certified local audiologists are serving in various public and private employment sectors across the country, of which 198 are working in 48 government hospitals [5]. According to the Department of Statistics Malaysia 2024, with a population of 34 million Malaysians, there is currently one audiologist for every 42,500 people (1:42,500). This ratio is significantly lower than the projected need, which is one audiologist for every 500 people (1:500) [5]. This shortage is especially pronounced in rural and underserved areas, where geographic and logistical challenges further impede service delivery.

The shortage of audiologists, particularly in underserved areas, underscores the need for innovative solutions to improve access to hearing healthcare. In response, the Ministry of Health (MOH) has introduced initiatives like tele-audiology and community-based rehabilitation programs to address this gap [6]. A survey of 43 Malaysian audiologists found that about 50% believed tele-audiology could positively impact care quality and accessibility, with higher adoption willingness if it improved care quality [7].

The pure-tone audiometry is the gold standard for measuring hearing sensitivity. It is conventionally carried out manually by an audiologist or other skilled operator–using standardised methodology [8]. Air and bone conduction hearing thresholds are measured for tonal stimuli at frequencies from 0.25 to 8 kHz with calibrated audiometers and transducers. It provides comprehensive information on hearing severity and type of hearing loss at specific frequencies [9].

Provision of an alternative approach to PTA is long anticipated, as it is unrealistic to expect the number of audiologists to increase soon [10]. The use of self-assessment technologies, such as the development of automated hearing assessment tools, is one way to address this deficit [11]. Automated protocols have existed for several decades and are increasing in popularity, especially in the light of the recent Covid-19 pandemic and the growing field of teleaudiology [8].

One such example of the many automated audiometry tools available is the Automated Method for Testing Auditory Sensitivity (AMTAS). AMTAS, developed by Robert Margolis in 2007, is a self-administered automated audiometry tool validated in English-speaking populations [12]. Despite its success abroad, it has not been adapted for non-English-speaking populations, such as Malay speakers in Malaysia, which limits its widespread use in a country where Malay is the primary language.

Previous research like Katz [9] has highlighted the importance of clear instructions in pure-tone testing to mitigate response bias, emphasising the need for validated translations to ensure equivalent accuracy. To date, no research has addressed the adaptation of AMTAS for Malaysia, leaving a critical gap in the availability of automated hearing assessment tools for Malay-speaking populations.

This study addresses this gap by translating the AMTAS instructional video into Malay, focusing on the methodology and implementation of this translation process. By narrowing the scope to this essential first step, the study provides a foundation for future research on the validity, reliability, and usability of the adapted tool. These subsequent investigations will be critical for ensuring the tool's effectiveness and its broader integration into clinical and community settings across Malaysia.

Translation plays a vital role in accurately conveying meanings from non-English-speaking populations to a broader audience [13]. This process is shaped by factors such as the researcher's background, language choices, the translator's or interpreter's role, and the style of translation used [14,15]. Translate is a verb that means to turn into own's or another language. Translation is

frequently viewed as an objective and impartial process, with the translator seen as a "technician" responsible for producing texts in various languages [16].

We aim to translate the instructional video for AMTAS using verbatim translation. According to Merriam-Webster dictionary, verbatim is defined as being in or following the exact words; word-for-word. Verbatim translation is the standard for ensuring the highest level of accuracy. This process involves translating the original content word-for-word into the target language. Unlike backward translation, which involves translating text back into the original language forward translation is used in this study to maintain the integrity of the original instructions [13].

By focusing on translating the AMTAS instructional video, this research aims to enhance the accessibility of self-administered hearing assessments for Malay-speaking users. This effort addresses a critical barrier in Malaysia's healthcare system and provides a model for adapting similar tools in other linguistically diverse settings, ultimately supporting the broader integration of automated hearing assessments in global healthcare.

## 2. Methodology

In this study, we began with a verbatim translation of the AMTAS instructional video from English into Malay. This step aimed to maintain high fidelity to the original content by ensuring a word-for-word translation. Every word spoken in the original AMTAS instructional video was carefully transcribed into written text. This transcript served as the foundational material for the translation process. We collaborated with the School of Languages, Literacies, and Translation (SoLLaT) at Universiti Sains Malaysia (USM) for this translation. SoLLaT's expertise in language translation was instrumental in converting the instructional content accurately into Bahasa Malaysia, and they generously provided this service without any cost, supporting the accessibility of the study for Malay-speaking users.

After the initial translation, we needed to convert the Malay translation into an audio format suitable for the instructional video. To achieve this, the project team partnered with the Selangor Public Library Corporation to utilize the recording facilities at the Raja Tun Uda Library. This facility, known for its high-quality sound recording environment, was ideal for producing a clear and professional audio recording (see Figure 1). Using the Malay translation provided by SoLLaT, a native Malay speaker with experience in voice recording was selected to read the instructional script, ensuring that the intonation and pacing were both clear and engaging for the audience. The recording session adhered to strict quality protocols to minimize any ambient noise or distractions, producing an audio track that closely matched the clarity of the original English version.

Once the voice recording was completed, the next phase involved post-production editing to fine-tune the audio. We enlisted a certified sound editor on-site at the Raja Tun Uda Library to enhance the quality and precision of the recording. This editing process included adjusting volume levels, removing any background noise, and ensuring smooth transitions between sentences to create a cohesive audio experience. The editor's expertise was crucial in achieving a seamless, professional-grade voiceover that aligned with the video visuals. We covered a nominal editing fee for these services, which contributed to the production of a polished instructional video that could be confidently presented to Malay-speaking audiences.

With the voice recording edited and finalized, the next step was to integrate the Malay audio into the AMTAS instructional video. This required disabling the default English audio settings in the AMTAS software to replace the original English audio with the new Malay recording. This integration step was critical to ensure that the software played the correct language version automatically, offering a tailored experience to Malay-speaking users without any additional setup. The technical

adjustments in the AMTAS software allowed for seamless playback of the Malay audio, maintaining the same timing and synchronization with the visuals as the original version.

Finally, after completing this translation, recording, and integration steps, we tested the functionality of the instructional video within the AMTAS software to confirm that the Malay audio played accurately and aligned with the visual content. This testing phase ensured that the instructional video would deliver clear and accessible information to Malay-speaking users in clinical and community settings. The resulting Malay version of the AMTAS instructional video was prepared for the subsequent phases of the study, where it would undergo usability, validity, and reliability testing with participants from clinical and non-clinical environments.

After the translation and integration of the Malay instructional video into AMTAS, user feedback will be collected systematically through questionnaires during the usability testing phase. Participants will provide insights into the clarity, tone, and pacing of the instructions, as well as their overall user experience. This feedback will be used to refine future iterations of the instructional video to ensure it meets the needs and preferences of the target population.

**Fig. 1.** Sound studio used for voice recording in Malay

## 3. Results

The role of clear instruction is paramount in hearing assessments, as it directly impacts the participant's response behaviour, thereby influencing the threshold measurements obtained. Research shows that the willingness to respond to faint tones varies among individuals, often leading to differences in the auditory thresholds measured. Some participants may choose to respond only when they are certain they hear a tone, leading to higher thresholds, while others may respond at the faintest sound, resulting in lower thresholds [9]. To mitigate variability in responses, it is essential to provide clear and consistent instructions that prompt participants to indicate their perception of tones, regardless of their volume. This approach helps achieve uniformity in responses among a

varied participant demographic, which is vital for the precision and dependability of auditory evaluations.

Adhering to the American Speech-Language-Hearing Association (ASHA) 2005 guidelines, our translated instructions emphasized key elements of the response task. Participants were instructed to begin responding when they heard a tone and to cease when it stopped. By providing instructions in the participants' primary language, we anticipated a reduction in misunderstandings and greater compliance with test requirements, improving the precision of threshold measurements [17].

In adapting the AMTAS instructional video to Malay, we implemented a verbatim translation approach to ensure accessibility and maintain the original instructional integrity. Verbatim translations, which follow a word-for-word translation style, are widely used in healthcare settings to maintain instruction accuracy while adapting to local languages [14,15]. The decision to use this approach was based on the national prevalence of Bahasa Malaysia and the need for an inclusive testing tool that accommodates non-English speakers. Studies indicate that such adaptations significantly enhance user confidence, as participants are more comfortable engaging with content in their native language [13].

The integration of the translated instructional video involved three key stages. These stages are central to our results, as they outline the process used to create an accessible and reliable instructional resource for Malay-speaking participants:

i. Verbatim Transcription of the English AMTAS Instructional Video:
The initial step involved a meticulous transcription of the words spoken in the original AMTAS instructional video. Every spoken word was carefully transcribed into written text, ensuring that the instructional content was fully captured. This written record served as the foundational material for subsequent translation efforts and maintained the integrity of the original instructional sequence and terminology.

ii. Translation into Bahasa Malaysia by Researchers:
Following transcription, the transcribed English text was translated into Bahasa Malaysia. This initial translation was conducted by the research team, who carefully converted each phrase and instruction to reflect the linguistic and cultural nuances of Bahasa Malaysia. This step ensured that the translated content would be readily understandable and appropriately adapted for a Malay-speaking audience, thereby supporting participant comprehension and comfort with the instructional material.

iii. Final Translation by SoLLaT at Universiti Sains Malaysia (USM):
To ensure linguistic accuracy and cultural sensitivity, the initial translated text was submitted to the School of Languages, Literacies, and Translation (SoLLaT) at USM. The final translation was carefully reviewed and refined by a publication officer at SoLLaT, whose expertise ensured that the instructions were not only linguistically precise but also culturally appropriate. This collaborative review process was crucial in achieving a high-quality final translation, suitable for integration into the AMTAS software.

Each of these steps contributed to the development of a culturally and linguistically tailored instructional video that enhances accessibility for Malay-speaking users. The systematic approach used in these three stages laid a foundation for accurate auditory sensitivity testing in diverse community and clinical settings, supporting the primary objectives of this research study. Table 1 outlines the three procedures taken to achieve this objective.

**Table 1**
Translation procedures of AMTAS instructional video

| | Original text (english version) | Translated text by researchers | Translated text by SoLLaT USM |
|---|---|---|---|
| 1 | Welcome to GSI AMTAS | Selamat datang ke GSI AMTAS | Selamat datang ke GSI AMTAS |
| 2 | When the test starts, a series of tones will be presented | Bila ujian bermula, beberapa nada akan dipersembahkan | *Apabila* ujian bermula, beberapa nada akan *dibunyikan* |
| 3 | The tones will be different pitches and different volumes | Nada akan berbeza pic dan berbeza kelantangan | Nada *yang dibunyikan* akan berbeza *dari segi* pic *dan tahap* kelantangan |
| 4 | Some will be easy to hear | Sebahagiannya akan mudah didengari | Sebahagian *nada* akan mudah didengari |
| 5 | And some you will not hear at all | Dan sebahagiannya tidak akan didengari sama sekali | Dan sebahagiannya tidak akan didengari *langsung* |
| 6 | Sometimes you may hear some noise | Adakalanya anda mungkin dengar sedikit bunyi bising | Adakalanya anda mungkin *mendengar* sedikit bunyi bising *atau mendengar* sedikit *gangguan* |
| 7 | If you hear the noise, ignore that and only respond to the tone | Jika anda dengar bunyi bising, abaikannya dan respon kepada nada sahaja | Jika anda *mendengar* bunyi bising *atau mendengar gangguan*, abaikannya dan respon*s* kepada nada sahaja |
| 8 | Listen for the tone and indicate your respone | Dengar nada dan nyatakan respons anda | Dengar*kan* nada dan nyatakan respons anda |
| 9 | Select the green YES or the red NO button by touching or clicking the appropriate icon | Pilih butang hijau YES atau butang merah NO dengan menyentuh atau mengklik ikon yang berkenaan | Pilih butang hijau *YA* atau butang merah *TIDAK* dengan menyentuh atau *menekan butang* yang berkenaan |
| 10 | The tones will only be presented one time and there will not be an option to change your answer | Nada hanya akan dipersembahkan satu kali dan tidak akan ada pilihan untuk menukar jawapan anda | Nada hanya akan *dibunyikan sekali sahaja* dan tidak akan ada pilihan untuk menukar*kan* jawapan anda |
| 11 | When you start the test, you cannot exit until the test is completed | Bila anda memulakan ujian, anda tidak boleh keluar sehingga ujian itu selesai | *Apabila* anda memulakan ujian, anda tidak *dibenarkan* keluar sehingga ujian selesai |
| 12 | Let's begin now | Ayuh kita mulakan sekarang | *Mari* kita mulakan *ujian* |

The final translation was recorded in Bahasa Malaysia at the sound studio of Raja Tun Uda Library, utilizing a native speaker to ensure correct pronunciation and intonation, which are essential in creating clear instructional materials [18]. A certified sound editor was engaged to ensure a professional and high-quality audio output. Afterward, we integrated the audio into the AMTAS software by disabling the default English video settings and aligning the new audio track with the visual instructions. Testing confirmed that the Malay instructional video functioned seamlessly within the AMTAS software, meeting accessibility objectives for Malay-speaking users in clinical and community settings.

Beyond the immediate scope of this study, translating the entire AMTAS interface into Bahasa Malaysia would further enhance accessibility, particularly for community-wide testing initiatives. This expansion could bridge additional language gaps, ensuring that even participants with limited formal education or proficiency in English can confidently engage with the AMTAS system. Research on interface localization in health applications suggests that such adaptations can increase patient compliance and data accuracy, which is essential in underserved areas with linguistic diversity [18]. Expanding these efforts to the full AMTAS system could create a more inclusive and user-friendly environment for Malay-speaking participants, promoting better health outcomes and a higher degree of engagement [16].

The successful translation and adaptation of the AMTAS instructional video into Bahasa Malaysia contribute meaningfully to the field of audiology in Malaysia. By facilitating instruction comprehension in participants' native language, this adaptation improves the reliability of hearing assessments. Language-compatible instructional content has been shown to significantly improve participants' understanding of testing procedures, leading to more consistent and reliable data [19]. In Malaysia, where linguistic diversity is vast and regional dialects can vary, these translated instructions support a broader inclusion of community members who may otherwise face barriers in healthcare. Enhanced accessibility in hearing assessments is particularly impactful for rural areas, where hearing loss is underdiagnosed due to limited access to audiology services in local languages [20].

While this study focuses on adapting the AMTAS instructional video for Malay-speaking users, the implications extend to other linguistic groups in Malaysia, such as speakers of Mandarin, Tamil, and indigenous languages. Future adaptations of AMTAS could be tailored to these linguistic groups, ensuring equitable access to hearing assessments across the country. Additionally, the methodology and outcomes of this study offer a template for similar adaptations in other multilingual and multicultural regions. This framework for culturally relevant healthcare tool development advances the global accessibility of automated audiology solutions.

This translation and integration model provides a valuable template for similar adaptations in multilingual regions like Southeast Asia. Adapting the AMTAS instructional video into Bahasa Malaysia highlights the importance of accurate translations and culturally relevant content in making health technologies globally accessible. This study lays the groundwork for broader adoption of localized health applications, promoting inclusivity and usability across diverse populations.

In addition to validating the Malay version of AMTAS, this research emphasizes the importance of integrating user feedback into healthcare tool development. Future iterations of the instructional video will incorporate insights from users, refining its content to enhance clarity and accessibility. By prioritizing user-centered design, this iterative approach ensures that the tool remains relevant and effective in addressing the needs of the target population.

## 4. Conclusion

In conclusion, the successful translation and integration of the AMTAS instructional video into Bahasa Malaysia addresses a critical gap in hearing assessment accessibility in Malaysia. By providing instructions in the national language, this initiative enhances the usability of AMTAS, particularly for individuals in rural or underserved areas who may face language barriers. The translated video improves user understanding and comfort, leading to more accurate and reliable hearing assessments. This effort not only contributes to improving audiological services in Malaysia but also serves as a model for similar adaptations in other multilingual regions, potentially expanding the global usability of automated hearing assessment technologies.

As the next step, this research will continue by utilizing the Malay instructional video to thoroughly test the validity, reliability, and usability of AMTAS in various Malaysian communities. Conducting these assessments within the local population will further demonstrate the efficacy of the AMTAS with Malay instructional video and ensure it meets the standards required for accurate, accessible hearing evaluation in Malaysia. Additionally, future steps should focus on translating the entire AMTAS interface to enhance accessibility for Malay-speaking users and promote wider adoption across diverse linguistic populations.

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