

## A Preliminary Study on the Adaptation and Validity of The Malay Version Device Oriented Subjective Outcome (DOSO) Scale

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### ABSTRAK

Kajian ini bertujuan untuk mengadaptasi skala 'Device-Oriented Subjective Outcome' (DOSO) ke dalam bahasa Melayu yang boleh digunakan untuk populasi dewasa Malaysia bagi mengukur hasil pemakaian alat bantu pendengaran. Kajian keratan rentas ini melibatkan lima peringkat: (i) terjemahan ke hadapan; (ii) sintesis terjemahan; (iii) terjemahan ke belakang; (iv) semakan oleh jawatankuasa kepakaran; dan (v) kesahan muka oleh pelajar audiologi ( $n=30$ ) dan audiologis ( $n=30$ ) melalui borang atas talian. Skor min pemahaman untuk pelajar audiologi ialah 94.7% ( $SD = 7.8\%$ ) dan untuk audiologis ialah 91.6% ( $SD = 13.1\%$ ). Skor min pemahaman bagi penutur asli Bahasa Melayu ialah 93.0% ( $SD = 10.4\%$ ) dan bagi penutur bukan asli ialah 93.6% ( $SD = 10.4\%$ ). Ujian Mann-Whitney U menunjukkan tiada perbezaan yang signifikan dalam skor pemahaman antara audiologis dan pelajar,  $U = 764$ ,  $z = -1.08$ ,  $p = 0.28$ ; dan antara penutur asli-Bahasa Melayu dan penutur bukan asli,  $U = 723$ ,  $z = -1.46$ ,  $p = 0.14$ . Ini menunjukkan bahawa responden pelbagai kaum boleh memahami terjemahan awal skala DOSO Bahasa Melayu. Terjemahan awal skala DOSO bahasa Melayu ini sedia untuk digunakan oleh ahli audiologi untuk mengukur hasil penggunaan alat sebagai sebahagian daripada proses pemulihan pendengaran. Ujian dan pengesahan lanjut dalam kalangan pengguna alat bantu pendengaran adalah disyorkan.

**Kata kunci:** DOSO; Bahasa Melayu; terjemahan

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## ABSTRACT

The current study aimed to adapt the Device-Oriented Subjective Outcome (DOSO) scale into the Malay language which can be used for the Malaysian adult population to measure hearing-aid amplification outcomes. This cross-sectional study involved five stages: (i) forward translation, (ii) synthesis of the translation, (iii) backward translation, (iv) expert committee review, and (v) face validity by audiology students ( $n=30$ ) and audiologists ( $n=30$ ) via an online form. The mean comprehension score for audiology students was 94.7% ( $SD = 7.8\%$ ) and for audiologists was 91.6% ( $SD = 13.1\%$ ). The mean comprehension score for native-Malay speakers was 93.0% ( $SD = 10.4\%$ ) and for non-native speakers was 93.6% ( $SD = 10.4\%$ ). Mann-Whitney U test showed no significant difference in comprehension scores between audiologists and students,  $U = 764$ ,  $z = -1.08$ ,  $p = 0.28$ ; and between native-Malay and non-native speakers,  $U = 723$ ,  $z = -1.46$ ,  $p = 0.14$ . This suggests that multiracial respondents can comprehend the preliminary Malay-translated DOSO scale. A preliminary Malay-translated DOSO scale is available for use by audiologists to measure device outcomes as part of the aural rehabilitation process. Further validation and testing among hearing-aid users is recommended.

Keywords: DOSO; Malay language; translation

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## INTRODUCTION

The World Health Organisation stated that around 5% of the world's population has disabling hearing loss that requires aural rehabilitation (WHO 2024). Hearing aid fitting is part of the aural rehabilitation process and patient-reported questionnaires are commonly used to measure the outcomes of hearing aid amplification among the adult population (Oh et al. 2016). These patient-reported questionnaires are used to determine the effectiveness of hearing-aid amplification in real-world listening situations and are referred to as subjective outcome measures. These patient-reported questionnaires can be used to examine different domains of hearing aid outcomes, such as hearing handicaps (e.g. Hearing Handicap Inventory for Elderly [HHIE], Ventry & Weinstein 1982; Hearing

Handicap Inventory for Adults [HHIA], Weinstein 1997), benefits (e.g., Hearing Aid Performance Inventory [HAPI], Walden et al. 1984; Shortened Hearing Aid Performance Inventory for the Elderly [SHAPIE], Dillon 1994; Abbreviated Profile of Hearing Aid Benefit [APHAB], Cox et al. 1995), satisfaction (e.g., International Outcome Inventory [IOI-HA], Cox et al. 2002; Satisfaction with Amplification in Daily Life [SADL], Cox et al. 1999), amount of use, remaining problems and improvement of quality of life. The use of patient-reported questionnaires may help to improve the quality of life and patient-centeredness of hearing rehabilitation (Snyder et al. 2013).

Studies have shown that personality traits (e.g., neuroticism, extraversion and agreeableness) may influence the responses of self-reported questionnaires

10 to 30% of the time (Cox et al. 2007; Kaymakçı et al. 2023). Therefore, Cox et al. (2007) suggested that self-reported questionnaires can be categorised into two broad categories: user-oriented and device-oriented questionnaires, depending on how much association the items have with the respondents' personalities. Device-oriented questionnaires are designed to minimise the influence of personality by using wordings (e.g., 'How well does the hearing aid...') that direct the items in the questionnaire toward the device (Cox et al. 2009; Cox et al. 2014). The device-oriented questionnaire is more suitable when the aim is to measure or compare different technologies between devices or new processing strategies in hearing aids.

One such device-oriented questionnaire is the Device-Oriented Subjective Outcome (DOSO) scale (Cox et al. 2009; Cox et al. 2014). The DOSO scale was developed according to the principles of classical test theory that involved a few processes: (i) development of initial item pool; (ii) administration of items to hearing aid wearers; (iii) data review and removal of unsuitable items; (iv) analysis of remaining items; and (v) selection of final items for the questionnaire (Cox et al. 2014). In the early stage of developing the DOSO scale, 140 potential items were identified and reviewed by several clinical audiologists and hearing aid users. Subsequently, 75 items were retained as the initial items and were administered to 295 participants via mail. Principle component analysis was conducted and 40 items were selected to construct six subscales in the DOSO scale: (i) speech cues (14 items); (ii) listening effort (10 items); (iii) quietness (5 items); (iv) pleasantness (4 items); (v) convenience (4 items); and (vi) use (3 items). These

subscales may reflect several equivalent domains, such as benefit (speech cues and listening effort subscales), performance (quietness, pleasantness), satisfaction (convenience) and hearing aid (HA) use (use). This 40-item questionnaire is known as the DOSO scale long form. There are two versions of DOSO short forms (i.e., the 28-item DOSOa & DOSOb). These short forms contain the same items under four subscales as in the long form: (i) quietness (5 items); (ii) pleasantness (4 items); (iii) convenience (4 items); and (iv) use (3 items). However, the number of items under the 'speech cues' subscale in the DOSO long form (n=14) was split into half (n=7) to be included in DOSOa and DOSOb. Similarly, the number of items under the 'listening effort' subscale in the DOSO long form (n=10) was split into half (n=5) to be included in DOSOa and DOSOb.

Preliminary data showed that four of the six DOSO subscales (i.e. speech cues, quietness, pleasantness, and use) have a low association with personality. This shows that the DOSO scale is less influenced by personality when compared to other questionnaires (e.g. APHAB, SADL, HHIE). Interim norms were derived from 179 patients for each subscale.

Cox et al. (2014) suggested the short form may be used in clinical settings and the long form may be used in research settings. Palmer (2015) recommended using DOSO as an outcome assessment tool for matching devices with user's needs. Other potential applications include comparing devices during the hearing-aid trial or settings of certain features. Therefore, the results of the DOSO scale may help clinicians to recommend or allow patients to choose a device setting

based on empirical findings.

According to the website of the Hearing Aid Research Lab (HARL), University of Memphis, the original version of the DOSO scale is in English and it has been translated into Mandarin language (<https://harlmemphis.org/device-oriented-subjective-outcome-doso-scale/>). However, it has not yet been adapted into the Malay language at the time of this study. The Malay language is an official language in Malaysia and the majority of the Malaysian population speaks the Malay language as their mother tongue (Department of Statistics Malaysia 2019). Furthermore, only limited self-reported questionnaires, such as the Speech, Spatial, and Qualities of Hearing Scale (SSQ) (Quar et al. 2019) have been adapted to the Malay language. However, these adapted questionnaires are insufficient to cover the multidimensional assessment of outcomes such as performance, benefits, satisfaction and use. Hence, there is a need to adapt the DOSO scale to the Malay language for wider usage and also to benefit more clinicians and HA users. The present study aimed to adapt the DOSO scale into the Malay language to be used by audiology students and audiologists as an outcome measure for their clients. Specifically, the comprehensiveness of the translated items was assessed and a preliminary translated Malay DOSO scale was produced.

## MATERIALS AND METHODS

This validation study involved a translation and/or adaptation process according to the stages stipulated in Quar et al. (2019) and Hall et al. (2018). It involved five stages: (i) Stage 1 forward translation; (ii) Stage 2 synthesis of the translation;

(iii) Stage 3 backward translation; (iv) Stage 4 committee review; and (v) Stage 5 face validity. The research protocol was approved by the Research Ethics Committee of the National University of Malaysia (UKM PPI/111/8/JEP-2020-056).

## Materials

The original DOSO scale (40-item long form) was used as the material for Stage 1 forward translation. The DOSO long form included 42 items (40 questions, 1 instruction, and 1 set of response options). The permission to adapt the DOSO scale into Malay language was obtained by and granted to the first author, by the Hearing Aid Research Lab (HARL), University of Memphis.

## Participants

Each stage of the current project involved different participants recruited via a purposive sampling technique. Two translators were recruited in Stage 1 forward translation (T1 and T2). T1 was a native Malay female audiologist who obtained Band 4 for the Malaysian University English Test (MUET), equivalent to a band score of 6.0 of the International English Language Testing System (IELTS) and a score of 60 for the Test of English as a Foreign Language (TOEFL). T2 was a native Malay female teacher with a Teaching English as a Second Language (TESL) qualification. Both T1 and T2 were fluent in Malay and English languages.

Two audiologists (A1 and A2) with more than eight years of working experience were the expert review committee in Stage 2 synthesis of the translation and Stage 4 committee review. A1 is an

expert in amplification and A2 is a native Malay speaker who is an expert in aural rehabilitation. The expert committee's role was to consolidate all the versions of the translations and produce a prefinal version Malay-translated DOSO scale for face validity among testers (i.e., audiologists or audiology students). At the end of Stage 5 face validity, A1 and A2 also reviewed suggestions provided by the participants and further modifications were made to produce a preliminary Malay-translated DOSO scale.

Another two translators were recruited in Stage 3 backward translation (T3 and T4). T3 was an English teacher with a qualification in TESL while T4 was an audiologist who obtained Band 4 for MUET. Both T3 and T4 were unaware of the original questionnaire. In Stage 5 face validity, a total of 60 respondents, including audiologists and audiology students, were recruited. This was because the Malay-translated DOSO questionnaire would be used as teaching materials for local Audiology students. Hence, this preliminary study conducted face validity on audiology students and audiologists, instead of hearing aid users (Wickens et al. 2015). However, we aimed to conduct face validity among HA users in a larger-scale study much later.

## Procedures

In Stage 1 forward translation, T1 and T2 were given a week to translate the original DOSO scale into Malay with a simple instruction given before the translation process. The translations were done independently by both translators. In Stage 2 synthesis of the translation, the DOSO scales translated by T1 and T2

were reviewed, discussed and modified by the expert committee to closely reflect the original English version. The output was a harmonised Malay version of the DOSO scale.

In Stage 3 backward translation, T3 and T4 were also given a week to independently translate the harmonised Malay version of the DOSO scale back into English. In Stage 4 committee review, the expert committee reviewed, discussed and modified the backward translations by T3 and T4. The harmonised version was compared against the original DOSO scale in English to ensure the back-translated English version reflects the same item content as the original English version. Stage 1 to Stage 4 was conducted between 21<sup>st</sup> February 2020 (the date of ethics approval) and 17<sup>th</sup> March 2020 (right before the start of the movement control order in Malaysia due to the COVID-19 outbreak).

In Stage 5 face validity, an online survey was adopted due to the movement control order during the COVID-19 outbreak in Malaysia. The prefinal version Malay-translated DOSO scale was converted into a Google Form and the link to access the form was distributed to audiology students and audiologists who work at the Audiology and Speech Sciences Clinic, National University of Malaysia; private hearing aid centres, and hospitals through WhatsApp or e-mail. The participants were asked to fill in a demographic form and indicate whether they could comprehend each of the translated items of the prefinal version of Malay-translated DOSO by choosing a dichotomic answer (i.e., understand; don't understand). The expert committee subsequently reviewed the suggestions collected from the

respondents and further modifications on the translated items were made to form a finalised Malay-translated version of the DOSO scale.

### Data Analysis

The data was analysed descriptively. The discrepancies of translation between T1 and T2 and between T3 and T4 were categorised based on the number of word differences: (i) no difference, (ii) one- to five-word differences, and (iii) more than five-word difference. The mean and standard deviation of comprehension scores were calculated. The equation below was used to calculate the comprehension scores of each translated item (i.e., item-level comprehension scores):

## RESULTS

### Stage 1: Forward Translation

Two translated versions were obtained from T1 and T2. Each version had 42 translated items (40 questions, 1 instruction, and 1 set of response options). About 21.4% (n=9) of the items were translated the same between T1 and T2, whereas 78.6% (n=33) had some discrepancies. Of these 33 items, 31 items had one- to five-word differences while two items had more than five-word differences between T1 and T2.

### Stage 2: Synthesis of the Translation in Stage 1

A few changes were made during the expert committee review. Table 1 showed examples of the harmonised items of the Malay-translated DOSO scale. Some harmonised items were produced by

selecting either the translation of T1 or T2 whereas other items were produced by combining the translation of T1 or T2.

### Stage 3: Back Translation and Stage 4 Committee Review

In Stage 3, two versions of backward translation were obtained. Of the 42 back-translated items, 57.1% (n=24) had one- to five-word discrepancies whereas 42.9% (n=18) were translated the same between T3 and T4. In Stage 4, a few changes were made to produce the harmonised back-translated version. Some harmonised items were produced by selecting either the translation of T3 or T4 whereas other items were produced by combining the translation of T3 or T4, as shown in Table 2. Subsequently, the harmonised back-translated version was compared against the original DOSO scale in English to ensure both versions were compatible. Finally, a prefinal version of the Malay-translated DOSO scale was produced for pilot testing.

### Stage 5: Face Validity

- Demographic data

A total of 60 respondents (30 audiology students and 30 audiologists) participated in Stage 5, whereby 72% (n=43) were Malay, 25% (n=15) were Chinese and 3% (n=2) were Indian. The mean age of the participants was 27.17 years old (SD = 5.82; range = 22-50 years old). For the ability to read Malay, 80% (n=48) rated 5 (excellent), 18.3% (n=11) rated 4 (good), and only 1.7% (n=1) rated 3 (moderate). Among the non-native Malay participants (n=17), 47% (n=8) of them rated 5 (excellent).

TABLE 1: Examples of changes made for forward translated items

Original DOSO item	Translation by T1	Translation by T2	Harmonised Malay-translated version
<b>Harmonised version by selecting T1 or T2</b>			
Item 8: Making your voice sound natural to you?	<i>Menjadikan suara anda kedengaran semula jadi</i>	<i>Membuat suara kamu lagi bersifat semulajadi</i>	<i>Menjadikan suara anda kedengaran semula jadi</i>
Item 33: Making conversation easier.	<i>Memudahkan perbualan.</i>	<i>Membuatkan perbualan lagi senang.</i>	<i>Memudahkan perbualan.</i>
<b>Harmonised version by combining T1 and T2</b>			
Item 17: Cutting out background noise in a restaurant?	<i>Menghilangkan bunyi bisung di restoran.</i>	<i>Mengurangkan bunyi bisung pada restoran.</i>	<i>Mengurangkan bunyi bisung di restoran.</i>
Item 20: Not using up battery too fast?	<i>Bateri tidak habis terlalu cepat.</i>	<i>Tidak menghabiskan bateri terlalu cepat.</i>	<i>Tidak menghabiskan bateri dengan terlalu cepat.</i>
Item 37: Keeping loud sounds from being uncomfortable	<i>Mengelakkan bunyi kuat tidak sedap didengari.</i>	<i>Mengelakkan suara kuat daripada tidak selesa.</i>	<i>Mengelakkan bunyi kuat daripada menjadi tidak selesa.</i>
T1 = Translator 1; T2 = Translator 2			

TABLE 2: Examples of changes made for backward translated items

Harmonised Malay version	Translation by T3	Translation by T4	Harmonised back translation	Original DOSO item
<b>Harmonised back translation by selecting either T3 or T4</b>				
Item 20: <i>Tidak menghabiskan bateri dengan terlalu cepat.</i>	Do not drain the battery quickly.	Does not run out of battery quickly.	Do not drain the battery quickly.	Not using up battery too fast.
Item 33: <i>Memudahkan perbualan.</i>	Make conversation easier.	Able to ease conversation.	Make conversation easier.	Making conversation easier.
<b>Harmonised back translation by combining T3 and T4</b>				
Item 10: <i>Mendengar pengumuman di pasar raya dengan jelas.</i>	Capture the announcement clearly in supermarket.	Able to hear supermarket announcement clearly.	Capture supermarket announcement clearly.	Picking up overhead announcement in stores.
Item 37: <i>Mengelakkan bunyi kuat daripada menjadi tidak selesa.</i>	Avoid loud sounds from being uncomfortable.	Able to prevent loud noises from being uncomfortable.	Able to prevent loud sounds from being uncomfortable.	Keeping loud sounds from being uncomfortable.
T3 = Translator 3; T4 = Translator 4				

All respondents were asked to indicate their most used language; some reported using more than one language. A total 49 of respondents reported using Malay, 16 respondents using English, 10 respondents using Chinese, 2 respondents using Tamil, and 1 respondent using Cantonese. The students consisted of the third- and fourth-year students who started their clinical practicum for at least one year whereas the audiologist had at least of one-year working experience.

- Comprehension scores

Table 3 showed the overall comprehension scores, which were analysed as a whole, and also according to the employment status (audiologists vs. students) and ethnicity (native Malay vs. non-native speakers). Generally, the overall mean comprehension score was 93.2% (SD = 10.8%; range = 40.0% to 100.0%).

TABLE 3: Mean, standard deviations (SD), and range for comprehension scores.

Category	Mean	SD	Minimum	Maximum
Overall	93.2	10.8	40.0	100
Students	94.7	7.8	56.7	100
Audiologists	91.6	13.1	40.0	100
Non-Native Malay	93.6	10.2	58.8	100
Native Malay Speaker	93.0	10.4	46.5	100

Shapiro-Wilk normality test showed that all comprehension scores violated the normality assumption ( $p < 0.001$ ). Therefore, the Mann-Whitney U test was used to analyse the data. The results indicated that there was no significant difference between the comprehension scores of audiologists and audiology students,  $U = 764, z = -1.08, p = 0.28$ . The results also indicated that there was no significant difference between the comprehension scores of native Malay speakers and non-native speakers,  $U = 723, z = -1.46, p = 0.14$ .

- Further modifications

Suggestions from respondents were taken into consideration and alterations were made without changing the meaning of

the items. Table 4 showed some of the further modifications done. Finally, a preliminary Malay-translated DOSO scale was available as shown in the Appendix.

**DISCUSSION**

The primary objective of this study was to translate and adapt the original English DOSO scale into the Malay language, following the guidelines proposed by Hall et al. (2018). These comprehensive guidelines have been utilised in various studies for translating questionnaires into multiple languages, including French (Celis-Aguilar et al. 2020), Norwegian (Larsen et al. 2023), and Malay (Quar et al. 2019). The implementation of a detailed five-stage adaptation process ensured the translation’s accuracy and cultural



TABLE 4: Examples of further modifications that were done as indicated in italic font.

Harmonised Malay version	Finalised items
<b>Replacement of words</b>	
Item 2 <i>Memberikan kualiti bunyi yang menyenangkan.</i>	<i>Memberikan kualiti bunyi yang selesa.</i>
Item 18 <i>Menangkap bunyi yang perlahan selepas bunyi yang kuat.</i>	<i>Mendengar bunyi yang perlahan selepas mendengar bunyi yang kuat.</i>
<b>Rephrase sentence</b>	
Item 8 <i>Menjadikan suara anda kedengaran semula jadi.</i>	<i>Menjadikan suara anda sendiri kedengaran biasa seperti mana yang anda dengar.</i>
Item 13 <i>Mendengar pertuturan semasa bibir penutur tidak dapat dilihat.</i>	<i>Mendengar pertuturan walaupun tidak dapat melihat bibir orang yang sedang bercakap.</i>
Item 26 <i>Mudah untuk anda masukkan dan keluarkan dari telinga.</i>	<i>Alat mudah untuk dimasukkan dan dikeluarkan dari telinga anda.</i>

relevance.

During the forward and backward translation process, regional variance, idiosyncratic interpretations and inevitable translator blind spots can occur which may potentially reduce the validity of the translated material. Utilising only one translator hinders the opportunity to discuss and develop alternatives to the translations. Therefore, the current research employed two translators for forward translation and backward translation. Previous researchers recommended selecting translators who are experts in a particular field. This step is crucial to avoid literal translation due to a lack of technical knowledge and experience, which subsequently jeopardises the test validity (Hall et al. 2018). It is also recommended to involve bilingual translators who are highly fluent in both the original language and the target language, having the original language as their first language, and are unaware of the field (Martínez-Fernández et al. 2024). For these reasons, native

Malay-speaking audiologists and teachers with TESL qualifications were recruited in the current study. This is crucial to ensure the outcome of the translation is culturally appropriate and uses precise language for the targeted population. The translators were given explanations for any questions and doubts raised during the translation process as this approach brings different talents and backgrounds that may enhance the validity (Thammaiah et al. 2016).

During the process of producing a harmonised Malay translated version of the DOSO scale, some of the wordings were changed to have a closer or to suit the exact meaning of the original version. For example, the original DOSO uses the words ‘picking’ and ‘catching’ interchangeably, and we decided to translate it to ‘mendengar’ to bring the closest meaning. During the expert committee review, the compatibility between the back translations against the original DOSO scale was checked in English to resolve any discrepancies, and

decisions made were focused on semantic, experiential, and conceptual equivalence (Hall et al. 2018). The endpoint of Stage 4 was to reach a consensus on the first final version of the questionnaire in the target language (Acquadro et al. 2008) before proceeding to the next stage of the process.

Face validity is one type of validity before proceeding to a wider evaluation of its psychometric properties or before using the translation in real clinical research (Dalawi et al. 2023). It allowed the researcher to investigate and ensure that the original instructions, question items, and response scale were clearly expressed in the translated version (Antunes et al. 2012; Hall et al. 2018). The overall comprehension score of 93.2% indicates that participants found the translated DOSO scale easy to understand, suggesting that the translation preserved the original questionnaire's clarity and intent. Additionally, the similar comprehension scores between native and non-native Malay speakers (both around 93%) indicate that the scale is equally accessible to young Malaysian audiences with a health sciences background. This is particularly significant in a multicultural country like Malaysia, where many individuals may speak Malay as a second language, thus enhancing the scale's utility and applicability across different language backgrounds, particularly for audiologists and audiology students (Albahoth et al. 2024; David et al. 2009). Nonetheless, the similar comprehension scores between native Malay and non-native speakers might be attributed to the participant's knowledge in Audiology. Statistical analysis also showed no significant difference between the audiologists'

and audiology students' comprehension score, suggesting that regardless the years of study or experience in audiology, the participants are able to understand the items in the translated questionnaire.

This study accomplished its goal of translating and adapting the DOSO scale into Malay through a meticulous multi-stage process, ensuring both precision and cultural appropriateness. A well-adapted DOSO scale in Malay can significantly improve the assessment of hearing aid outcomes for Malaysian patients by providing a more precise and culturally relevant tool. Considering Malaysia's multicultural and multilingual population, a translated and validated scale captures the nuances of patient experiences with hearing aids more effectively. This cultural adaptation allows audiologists to better interpret patient feedback, leading to more personalised and effective hearing aid fittings and adjustments. The accuracy of the translated scale ensures that responses genuinely reflect patients' experiences, which is crucial for tailoring interventions to meet their specific needs.

Moreover, using a culturally relevant DOSO scale can greatly enhance patient satisfaction and clinical decision-making. When patients feel that their cultural and linguistic backgrounds are considered in their care, their trust in the healthcare system increases, leading to higher engagement and compliance with treatment recommendations. For clinicians, having a reliable and validated tool in the patient's primary language reduces miscommunication and misinterpretation of patient-reported outcomes, enabling more precise and informed clinical decisions. Ultimately, this contributes to better overall outcomes

and quality of life for hearing aid users in Malaysia.

One limitation of this study is the sample size, which may limit the generalisability of the findings. In addition, the sample of the current study involved young participants with Audiology knowledge, therefore, the results may not apply to non-Malay native speakers, particularly for the older populations. With a relatively small and specific participant pool, the results may not fully represent the broader population of hearing aid users in Malaysia. Consequently, the conclusions drawn from this study should be interpreted with caution, and replication with larger and more diverse samples is necessary to confirm the robustness of the findings. Samples for future research should include adult HA users of different ages and their family members who may need to comprehend and fill in the DOSO questionnaires.

Future research should focus on large-scale validation studies of the Malay-translated DOSO scale among a broad spectrum of hearing aid users. Such studies would help to establish the generalisability of the scale and confirm its utility across different demographic and clinical settings. While the adaptation process of the DOSO scale into Malay was thorough, further studies are required to validate the scale's psychometric properties. This includes testing for reliability, validity and consistency across various subgroups within the Malaysian population. Ensuring these psychometric qualities is essential for the scale to be considered a reliable tool for clinical use.

Moreover, it is crucial to assess the scale's reliability and validity in various clinical environments to ensure consistent

and accurate performance in real-world scenarios. Another important area for future research is to explore the scale's sensitivity to changes in hearing aid outcomes over time. Longitudinal studies can provide insights into how well the DOSO scale detects improvements or declines in hearing aid performance, thereby supporting its use in ongoing patient monitoring and management. Addressing these research areas will help to solidify the Malay-translated DOSO scale as a comprehensive and reliable tool for evaluating hearing aid outcomes in Malaysia.

## CONCLUSION

A preliminary Malay translation of the DOSO scale was produced. The results showed that both audiologists and audiology students could comprehend the translated items. Further studies are needed to examine the validity and reliability of the translated DOSO scale to ensure it can be used effectively as an outcome assessment tool in local audiology clinics.

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## DECLARATION OF INTEREST STATEMENT

The authors report there are no competing interests to declare.

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