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ORIGINAL ARTICLE

Translation, Validation and Reliability Testing of the Subjective Mental Effort Questionnaire (SMEQ) from English into the Malay Language

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ABSTRAK

Soal Selidik Usaha Mental Subjektif (SMEQ) ialah instrumen penilaian kendiri yang direka untuk menilai fungsi beban kerja mental seseorang individu. Beban kerja mental juga merupakan konsep yang digunakan secara meluas dalam ergonomik kognitif. Pada masa ini, alat penilaian untuk mengukur status ergonomik kognitif belum dibangunkan berdasarkan kajian dalam populasi Malaysia. Kajian ini bertujuan untuk menterjemah, mengesahkan dan menjalankan ujian kebolehpercayaan SMEQ versi Bahasa Melayu ke atas profesional kesihatan bersekutu di Melaka. Pembangunan melibatkan fasa terjemahan, pengesahan kandungan, pengesahan muka, temu bual kognitif dan ujian uji semula SMEQ versi Bahasa Melayu. SMEQ versi Bahasa Melayu mempunyai skor indeks kesahan kandungan (CVI) dan Kappa yang sempurna untuk pengesahan kandungan. Kesahan muka dan temu bual kognitif mengesahkan bahawa soal selidik mempunyai tatabahasa yang sesuai, kejelasan, ejaan perkataan yang betul, struktur ayat yang tepat, saiz huruf yang sesuai dan struktur instrumen yang jelas untuk populasi sasaran. Ujian pengesahan dan kebolehpercayaan selanjutnya menunjukkan bahawa SMEQ versi Bahasa Melayu mempunyai kebolehpercayaan ujian uji semula yang baik dengan pekali korelasi intrakelas (ICC) = 0.961 dan ralat piawai pengukuran (SEM) = 2.725. Kajian ini mendapati bahawa SMEQ versi Bahasa Melayu adalah alat yang sah dan boleh dipercayai untuk menilai fungsi beban kerja mental dalam populasi Malaysia. Kajian masa depan disyorkan untuk membandingkan versi Bahasa Melayu SMEQ

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antara pelbagai jenis pekerjaan di Malaysia menggunakan saiz sampel yang lebih besar dan menyiasat ujian psikometrik lengkap di antara pelbagai pekerjaan dan tugasan.

Kata kunci: Beban kerja mental; ergonomik kognitif; kesahan dan kebolehpercayaan; penilaian subjektif; SMEQ

ABSTRACT

A self-report tool called the Subjective Mental Effort Questionnaire (SMEQ) was used to evaluate a person's mental workload function. Mental workload is also a widely used concept in cognitive ergonomics. Currently, assessment tools to measure cognitive ergonomic status have not been developed based on studies in Malaysian population. The study's objectives were to translate, validate, and test the reliability of the SMEQ Malay version among Melaka-based allied health practitioners. Phases of translation, content validation, face validation, cognitive interviewing, and test-retest of the SMEQ Malay version were all included in the development process. The Malay version of the SMEQ had perfect content validity index (CVI) and Kappa scores for content validation. Face validity and cognitive interviews confirmed that the questionnaires had appropriate grammar, clarity, correct word spelling, accurate sentence structure, appropriate font size, and was a clear instrument structure for the target population. Further validation and reliability testing indicated that the SMEQ Malay version had good test-retest reliability, with an intraclass correlation coefficient (ICC) = 0.961 and an standard error of measurement (SEM) = 2.725. According to this study, the SMEQ Malay version was proven to be a viable and reliable instrument for evaluating mental workload function in the Malaysian population. Future studies are recommended to compare the SMEQ Malay version among different types of jobs in Malaysia using a larger sample size and investigate complete psychometric testing among various occupations and tasks.

Keywords: Cognitive ergonomic; mental workload; SMEQ; subjective measure; validity and reliability

INTRODUCTION

Cognitive ergonomics in the workplace has been emphasised for making work systems and performance more productive, increasing task efficiency, shortening the time required to achieve an objective, and reducing errors (Carayon et al. 2021; Venda et al. 2000; Young et al. 2015). Cognitive ergonomics is the understanding of human nature about mental processes at work (Berlin & Adams 2017). Task-related mental process activity can be

assessed based on mental workload (Babiloni 2019). Mental workload is the cognitive capacity required to perform tasks such as concentration, memory, and perception (Longo et al. 2022). It rises when a person is working long hours in a demanding setting, unfamiliar with the job, and under high technical pressure (Nasirizad Moghadam et al. 2019). Mental workload studies have evolved in recent years as cognitive demands have become a key occupational risk factor. Mental workload is a significant topic that must be addressed because of its effects on human error and performance.

Mental workload is a principal factor affecting employee performance. The healthcare sector reportedly has a high mental workload (Du & Hu 2021). Higher ratings for mental workload are found among health workers with higher education, more years of working experience, and higher professional titles (Du & Hu 2021). In addition to affecting performance, a high mental workload will interfere with reaction time during the work process and indirectly increase the occurrence of errors (Pourteimour et al. 2021). The mental workload of the allied health professions has received little attention. It is crucial to maintain a safe level of mental workload in the workplace because the human cost that needs to be borne to maintain work performance after problems such as fatigue, stress, illness, and accidents at work are very high (Hertzum & Holmegaard 2013; Jeffri & Awang Rambli 2021; Kantowitz 1987).

The most popular tools for assessing mental workload have been shown to be subjective measures (Estes 2015; Matthews et al. 2015). The subjective evaluation tool measures the burden that are felt by humans. Subjective measurement evaluation tools use questionnaires such as the Nasa Task Load Index (NASA-TLX), the Subjective Mental Effort Questionnaire (SMEQ), the Multiple Resources Questionnaire (MRQ), and the Subjective Workload Assessment Technique (SWAT) (Potter & Bressler 1989; Said et al. 2020; Sauro & Dumas 2009). The TLX, SWAT, and MRQ are multidimensional scales. As for subjective evaluation measurement tools, they are easier to use, have a higher level of acceptance, are low-cost and in the workplace and relatively unobtrusive (De Waard & Brookhuis 1996). In addition, subjective assessment measurement tools are also influenced by cultural factors (Dias et al. 2018; Fista et al. 2019).

Subjective Mental Effort Questionnaire

SMEQ is a unidimensional instrument that Zijlstra developed to assess mental workload in cognitive ergonomics (Zijlstra 1993; Zijlstra & Doorne 1985). The SMEQ is a single scale with nine labels on a long line ranging from 0 to 150 mm that measures the amount of mental effort needed to complete a task. Here are some instances of scale labels: 'no effort at all', which is close to 0 on the scale point, and 'exceptional amount of effort', which is 112 mm on the scale (Sauro & Dumas 2009; Widyanti et al. 2013). The SMEQ is also

known as the Rating Scale of Mental Effort (RSME) (Naderi 2018; Reinhardt & Hurtienne 2023; Sauro & Dumas 2009; Zijlstra 1993; Zijlstra et al. 1985). Both measure mental effort on a 9-point scale that ranges from great effort to zero effort (Nagyné Elek & Haidegger 2021). In the German version, SMEQ is called SEA-scale (Eilers et al. 1986; Wechsung 2014). The SMEQ is one of the most appropriate instruments to subjectively measure workload because it reflects more accurately the amount of effort needed for a task than other instruments (De Waard & Brookhuis 1996). This application is easy, fast, cheap, and does not require special equipment (Fista et al. 2019). The SMEQ has been utilised with great validity and reliability in a variety of laboratory and field research projects (Bevan & Macleod 1994). SMEQ is seen to have moderate convergent validity with NASA TLX and the Workload Profile (Longo 2018). The study also found that the SMEQ was more sensitive than the NASA TLX (De Waard & Brookhuis 1996).

The increasing emphasis on safety, health, and comfort in the workplace requires the assessment of mental workload as one of the important issues (Didomenico & Nussbaum 2011). Unfortunately, no translation of the SMEQ into Malay has been done, and there has not been much research published on the SMEQ's psychometric features for the Malaysian population. This was the first study to translate the SMEQ into Malay and to assess its psychometric features in a Melaka allied health population. This study could produce one of the cognitive ergonomic measurement assessment tools with good validity and reliability in Malaysia. Meanwhile, in the clinical field, the results of this study can be used as a guide to provide appropriate interventions regarding cognitive ergonomics. Given the significance of mental workload function to every employee, the current study's findings offered a useful tool in the regional tongue for use by Malaysian practitioners.

MATERIALS AND METHODS

This study focused on the translation, adaptation and validity of the form to strengthen the usability and benefits of the SMEQ form for the Malay-speaking population. When translating the questionnaire, forward and backward translations were employed. The development of the Malay version of the SMEQ form involved: (i) forward translation; (ii) evaluation expert and content validity; (iii) back translation; (iv) face validation and cognitive interviewing; as well as (v) examination of test-retest reliability. Figure 1 illustrated the entire procedure of translation in simplified form. The SMEQ form was translated as recommendations from previous studies on translation and cultural adaptation (Epstein et al. 2015; Lau et al. 2018; Shamsudin et al. 2019).

Study Design

The period covered by this cross-sectional study was from November 2022 to April 2023. The SMEQ was in the public domain; hence, no

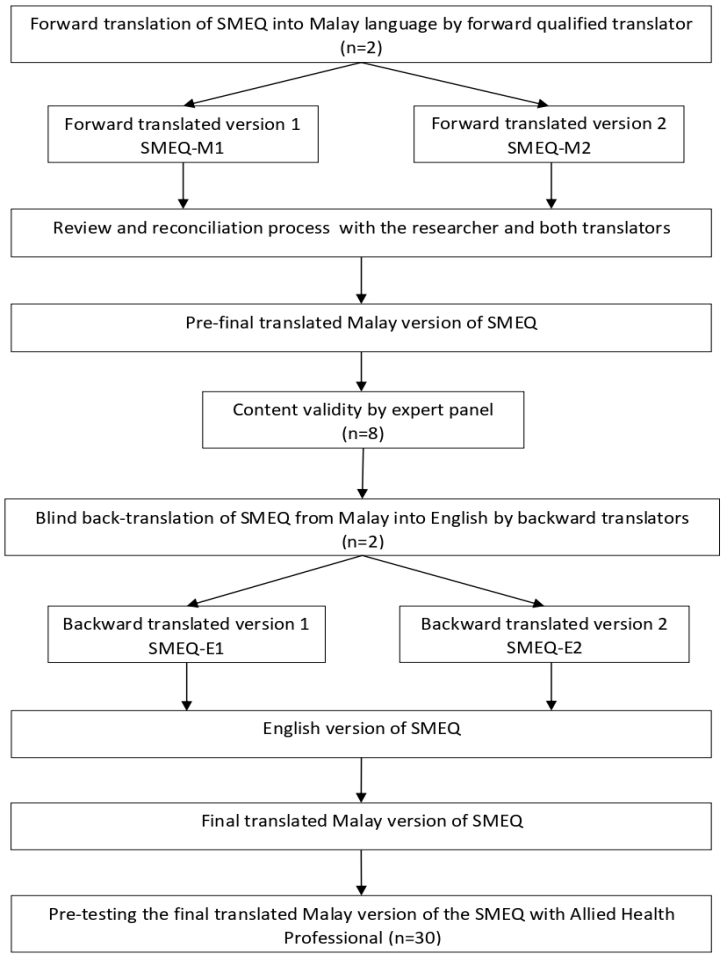

FIGURE 1: Translation and validation process Malay version of Subjective Mental Effort Questionnare (SMEQ)

permission was required for use as it was not patented or proprietary. The ethics approval was granted by the Medical Research and Innovation Secretariat of the National University of Malaysia (project code: UKM PPI/111/8/JEP-2022-525) and the Medical Research & Ethics Committee of the Ministry of Health Malaysia (NMRR ID-22-01822-HFY and NMRR ID-22-02035-3CM). Before being invited to participate in our study, each respondent was given the pertinent information, and online approval was obtained.

Forward Translation

Two certified independent translators translated the English questionnaires into Malay as part of the forward translation process. To find translators who met the requirements for inclusion, purposive sampling was adopted: a) a health professional who

is conversant with the terminology and subject matter of the instrument; b) a person with a bachelor's degree or higher; c) a native Malay speaker; d) a person who speaks both Malay and English. This study's translation was carried out by two lady translators, aged 33 and 34, with 6 and 8 years of professional experience, respectively. Both were certified translators recognised by the Malaysian National Institute of Translation. Malay was their first language. Translation results were compared and discussed with the researcher and both translators. Any differences in the translation were adjusted. Incongruence items were reviewed and modified during the reconciliation process to enable only one Malay version of the SMEQ Form.

Evaluation Expert and Content Validity

After forward translation, content validation of the SMEQ Malay version commenced instantly. In this step, the appropriateness of the final forward Malay translation was evaluated by expert reviewers (Epstein et al. 2015; Shamsudin et al. 2019). Purposive sampling was used to choose eight panel experts who met the inclusion requirements. Experts were selected among a doctor in a field related to rehabilitation or ergonomics or 20 years of working experience in the field of occupational therapy (Eliasson et al. 2006). Eight expert reviewers were sufficient to produce strong content validity index (CVI) results (Polit & Beck 2006; Polit et al. 2007). The demographics of the panel experts were shown in Table 1.

The content validity feedback forms were distributed to all expert reviewers, who were asked to assess the SMEQ Malay version using the four CVI criteria. Experts were instructed to rate each item on the scale using the four criteria of relevance, simplicity, clarity, and ambiguity using a 4-point Likert scale, where a score of 1 indicated the item was not relevant, a score of 2 indicated the item required some revision, a score of 3 indicated the item was relevant but required minor revision, and a score of 4 indicated the item was very relevant (Polit & Beck 2006; Zamanzadeh et al. 2014). The CVI for each item (I-CVI) was calculated by dividing the number of experts who rated an item as 3 or 4 by the total number of experts who rated that item. I-CVI that had a value equal to or greater than 0.70 was accepted (Kusi Amponsah et al. 2020; Tilden et al. 1990). The CVI for the average item

TABLE 1: Demographic characteristics of the expert panels

Expert Panel	N (%)
Gender	
Male	3 (37.5)
Female	5 (62.5)
Age group (years)	
40-44	1 (12.5)
45-49	2 (25.0)
50-54	1 (12.5)
55-59	4 (50.0)
Academic qualification	
Bachelor's degree	5 (62.5)
Master's degree	2 (25.0)
Philosophical Doctrine	1 (12.5)
Working experience (years)	
20-24	3 (37.5)
25-29	1 (12.5)
30-34	4 (50.0)

(I-CVI/Ave) was calculated by dividing the total score of I-CVI by the total number of items. An I-CVI/Ave equal to or greater than 0.90 was considered good (Polit & Beck 2006). The scale CVI based on the universal agreement method (S-CVI/UA) was calculated by dividing the total score of universal agreement that achieved a relevance rating of 3 or 4 by all the experts based on the total number of items. S-CVI/UA values of ≥0.8 indicated excellent content validity (Rodrigues et al. 2017). In addition, a modified Kappa analysis was conducted, which involved calculating Kappa using the probability of chance agreement (PC) and the I-CVI. According to Zamanzadeh et al. (2015) and Cicchetti & Sparrow (1981), a Kappa value greater than 0.74 was considered excellent. Following the finished content validation, the Malay version of SMEQ was revised and changed in accordance with helpful suggestions made by the expert panel before finalising.

Back Translation

During backward translation, the translated Malay questionnaires were subsequently translated back into the English language. Two other independent translators with criteria of fluency, sufficient knowledge spoke English and were unfamiliar with the original version of the SMEQ. Both backward translations of the English-translated questionnaires were discussed, and their differences and ambiguities were resolved. All the translators and members of the research team unanimously agreed on all edits and changes. The final versions of the questionnaires in Malay were pretested for response process validity.

Pre-testing of the Final Translated Malay Version of the SMEQ with Allied Health Professional

The final translated Malay version of the SMEQ was pre-tested with Allied Health Professions (AHP) working under the Ministry of Health's hospitals and health clinics in the State of Melaka and had at least one year of working experience. All participants agreed to participate in this study, and online informed consent was obtained.

Face Validation and Cognitive Interviewing

Face validity was conducted to assess whether all the words and phrases used in the Malay version of the SMEQ had appropriate grammar, clarity, correct word spelling, accurate sentence structure, appropriate font size, and instrument structure (Oluwatayo 2012; Shafie et al. 2020). A total of five members of the allied health profession were selected using purposive sampling (Cadogan et al. 2017). After filling out an online pre-test questionnaire, the participants were then involved in a face validity where they provided further feedback and identified their perception of what the questionnaire was measuring. A dichotomous scale with "yes" and "no" categories was used to check face validity. Those who rate "no" were asked to provide suggestions for

improvement. A cognitive interview with verbal probing techniques was used to test the understanding, confidence, and completeness of the items in the questionnaire (Willis 2005).

Test-retest Reliability

Additionally, it produced the data needed to determine the SMEQ Malay version's test-retest reliability. The study recruited 30 participants using a purposive sampling technique. The Sample Size Calculator was used to determine the required sample size, with a value of p1 = 0.9, = 0.05, study power = 80%, k = 2 and a dropout rate of 20% (Arifin 2018). A participant was omitted because the data were inadequate. According to the sample size calculation formula, a total of 29 participants was adequate to achieve 80% of the statistical power. Within one to five weeks of the first test, all of the participants finished the second round of the test, which took a mean of 17.66 $\pm$ 4.74 days. Table 2 provided a summary of the participants' demographic details.

TABLE 2: Demographic characteristics of the participants (n= 29)

Category	Total (N)	Percentage (%)
Gender		
Male	13	44.8
Female	16	55.2
Race		
Malay	27	93.1
Chinese	0	-
Indian	0	-
Others	2	6.9
Age group (years)		
20-29	5	17.2
30-39	16	55.2
40-49	6	20.7
50-59	2	6.9
Educational level		
Diploma	20	69.0
Bachelor's degree	9	31.0
Working experience (years)		
1-10	16	55.2
11-20	10	34.5
21-30	3	10.3
Profession		
Dietician	3	10.3
Physiotherapist	4	13.8
Nutritionist	1	3.4
Diagnostic radiographer	4	13.8
Medical laboratory scientist	1	3.4
Occupational therapist	8	27.6
Medical laboratory technologist	3	10.3
Dental technologist	4	13.8
Environmental health officer	1	3.4

RESULTS

Forward Translation

After receiving the original scale through email, two qualified translators independently translated the SMEQ from English into Malay. The SMEQ was translated into Malay by each of the translators. By contrasting the two forward-translated Malay-language SMEQ versions, the first author looked at any inconsistencies in terminology, phrasing, or meaning that might have existed initially. Four items needed minor revisions and rephrasing during the reconciliation of the forward translation as they could not be translated exactly into Malay. Since the words "fair", "reasonable", "some" and "a little" had the same meanings, the item was translated to "mencukupi" "hampir mencukupi", "sederhana" and "sedikit", which was the best to convey the meaning of the item and was sufficient to reflect the true meaning and purpose of the translated item. The researchers and translators had agreed to use these items as an alternative expression, for they could be more accurately translated into Malay. Then the harmonised pre-final translated Malay version of the SMEQ version was created.

Evaluation Expert and Content Validity

At this point, the panel served as the expert, as well as assessing and establishing the content's validity. Content validity, as measured by eight panel experts, was excellent. Regarding content validity, I-CVIs for the SMEQ Malay version were equal to 1.0. S-CVI/Ave and S-CVI/UA of the SMEQ Malay version also equaled 1.0 for all four criteria, indicating excellent content validity (Table 3). Modified kappa also reported scores for the SMEQ Malay version at 1.00. According to the suggestions made by all the panel experts, no item on the translated scale needed revision.

Back Translation

The reconciliation process revealed that the forward-translated (from English) SMEQ did not need any more adjustments.

Face Validation and Cognitive Interviewing

The face validation showed that all words and phrases used in the SMEQ Malay version had appropriate grammar, clarity, correct word spelling, accurate sentence structure, appropriate font size, and instrument structure. Cognitive interviewing yielded data that confirmed the words and phrases of the SMEQ Malay were clear to the target population.

Test-retest Reliability

The test-retest reliability used a two-way mixed effect model with an absolute agreement intraclass correlation coefficient (ICC) and a standard error of measurement (SEM). The ICC for the SMEQ Malay version test-retest reliability was 0.961, while the standard error of measurement

TABLE 3: Results on content validity and modified kappa of the Malay translation of the Subjective Mental Effort Questionnaire (SMEQ)

Translated Items	Relevance				Clarity				Simplicity				Ambiguity				Total S-CVI
	Number in Agreement	Item CVI	Pc	K	Number in Agreement	Item CVI	Pc	K	Number in Agreement	Item CVI	Pc	K	Number in Agreement	Item CVI	Pc	K	
Tiada usaha langsung	8	1	0.0039	1	8	1	0.0039	1	8	1	0.0039	1	8	1	0.0039	1	
Hampir tiada usaha	8	1	0.0039	1	8	1	0.0039	1	8	1	0.0039	1	8	1	0.0039	1	
Usaha yang sedikit	8	1	0.0039	1	8	1	0.0039	1	8	1	0.0039	1	8	1	0.0039	1	
Usaha yang sederhana	8	1	0.0039	1	8	1	0.0039	1	8	1	0.0039	1	8	1	0.0039	1	
Usaha yang hampir mencukupi	8	1	0.0039	1	8	1	0.0039	1	8	1	0.0039	1	8	1	0.0039	1	1
Usaha yang mencukupi	8	1	0.0039	1	8	1	0.0039	1	8	1	0.0039	1	8	1	0.0039	1	
Usaha yang banyak	8	1	0.0039	1	8	1	0.0039	1	8	1	0.0039	1	8	1	0.0039	1	
Usaha yang sangat banyak	8	1	0.0039	1	8	1	0.0039	1	8	1	0.0039	1	8	1	0.0039	1	
Usaha yang luar biasa	8	1	0.0039	1	8	1	0.0039	1	8	1	0.0039	1	8	1	0.0039	1	
	I-CVI/Ave	1			I-CVI/Ave	1			I-CVI/Ave	1			I-CVI/Ave	1			
	S-CVI/UA	1			S-CVI/UA	1			S-CVI/UA	1			S-CVI/UA	1			

*I-CVI/Ave=item content validity index/Average; S-CVI/UA=scale content validity index/universal agreement; Pc=probability of chance agreement; K= modified kappa

(SEM) was 2.725.

DISCUSSION

Using culturally adapted assessment instruments is especially important in healthcare sector because it can influence clinical decision-making (Pan et al. 2018). Furthermore, translating tools into Malay can ensure that customers or patients receive appropriate services (Ahmad et al. 2020). To obtain similar meaning, translation by meaning is preferable to the direct translation of component terms (Wei & Kun 2022). This current study translated and adapted the SMEQ from English into Malay and validated its suitability for the Malay-speaking Malaysian population.

In this study, two professional translators were utilised in forward translation to ensure the translation was of excellent quality (Hernández et al. 2020). Before the translations were harmonised, the first author of this article reviewed both forward-translated SMEQs and pointed out any inconsistent words, phrases, and sentences. This is due to the fact that the first author is more accustomed to the original tool (Shamsudin et al. 2019). During the translation process, the words "fair", "reasonable", "some effort", and "little effort" required minor modification and rephrasing during the forward translation coordination due to confusion of the order of the scale as the items had the same meaning in Bahasa Malaysia. This also happened during the translation of SMEQ into Indonesian. In a study conducted by Widyanti et al. (2013), the labels in the middle range of the scale were combined into one "moderate effort", leaving the anchor point scale from 9 to 7. The study also reported the same items showing low sensitivity when translated into Indonesian because of the Asian culture, which values obedience and civility over self-expression (Johnson & Widyanti 2011; Widyanti et al. 2013). The SMEQ is a self-reported evaluation of the mental effort necessary to complete a task. It demonstrates how culture influences an instrument's sensitivity.

This study followed the translation guidelines by Lau et al. (2018), in which content validity was conducted first before back translation. Based on the TRAPD framework (translate, review, adjudicate, pretest, and document), the review process by the expert is done after the translation (Walde & Völlm 2023). The TRAPD framework is a committee-based translation approach involving multiple review and coordination levels (Valdez et al. 2021). This is to ensure that the translation results match the linguistic and sociocultural elements of the source language to be translated (Willis et al. 2010). Expert panels are seen to contribute more in improving the quality of cross-cultural translation than back translation (Epstein et al. 2015). However, back translation remains useful in ensuring translation equivalence with the original version. The translator did not participate actively in the process of verifying the content of the Malay SMEQ, which is similar to the study done by Shamsudin et al. (2019). However, the author keeps in regular contact with

them in case there are any issues. Although this communication takes place by e-mail, it does not affect the discussion or generation of the SMEQ Malay Version. The overall CVI for the SMEQ Malay version in this study was 1.0, indicating that the information contains was very relevant to the outcomes being measured for the Malaysian population. All experienced panelists for this study showed high agreement about the translation content's relevance, simplicity, clarity, and ambiguity.

The translated Malay version of the SMEQ was face-validated by five allied health professionals to ensure that the scale measured was intended to target. Findings from face validity and cognitive interviews also supported the usefulness of the Malay version of the SMEQ. Furthermore, allied health respondents reported that the instrument was easy to understand, simple, and easy to use during cognitive interviews. A unidimensional scale has the advantage which is easier to use and less time-consuming because it only needs to answer one question (Alimohammadi et al. 2019; De Waard & Brookhuis 1996).

For test-retest reliability, an ICC reflected the agreement interval scores between the first and second assessments and was interpreted as excellent if the ICC value >0.90 (Koo & Li 2016). The SMEQ Malay version possessed an outstanding agreement level, according to statistical analysis, with ICC values above 0.90. In another study by Alimohammadi et al. (2019), they assessed the reliability of the Mental Effort Evaluation Scale, or SMEQ, in Iran using Pearson's correlation coefficient in the test and retest with two other self-reported measurement scales. The study's results found a high correlation coefficient of 0.96 for this measurement, representing this scale's reliability in Iran.

At the same time, the standard error of measurement will determine the amount of variation in the measurement error of a test. If a large change is detected with the instrument, the measurement error is high and lowers the test's reliability (Zetterberg et al. 2019). This SEM value helped practitioners to estimate individual test scores' boundaries while using the Malay version of the SMEQ.

Besides test-retest reliability, the questionnaire's reliability is usually determined by testing the internal consistency of the items of a multi-dimensional instrument construct, which can be achieved when the internal consistency value is based on Cronbach's alpha. The Cronbach's alpha value generally measures the degree of correlation between each item when measuring a construct. This study's internal consistency was not conducted on the SMEQ due to its unidimensional nature (Longo 2018).

One of the limitations of this study was that the number of race participants was not balanced, and 27 out of 29 participants were Malay. According to data from Rotem & Roberts (2020), Malays made up 74%, Chinese 4.9%, Indians 3.8%, and others 17% of the total allied health workforce at Ministry of Health Malaysia (KKM). Since only one state was involved in this study and the small population of Melaka,

where the study was conducted, might affect the participation of other races. Furthermore, the distribution of questions online posed a challenge for researchers to determine the involvement of all races. Since Malaysia is multi-racial and the Malays are the largest race in Malaysia, but other races also contribute to the formation of culture in Malaysia. Further research should take these aspects into account, as it could have an impact on the outcomes.

CONCLUSION

This study's results support the notion that SMEQ's Malay version possesses strong content validity, face validity, and test-retest reliability. Moreover, the Malay version of the SMEQ has shown very satisfactory general psychometric properties and can be used in measuring mental workload function. Part of the recommendations suggests that future research should fully examine the psychometric properties of the SMEQ's translated Malay version across a wide range of tasks and occupations in Malaysia using a larger sample size in order to assess the scales' applicability to other professions. With this endeavor, we hope to spread the use of the SMEQ Malay version to assist practitioners in assessing individuals' mental workload function while allowing the practitioners to examine the effectiveness of their task performances in Malaysia.

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