Validating Measurement of Health Literacy among Adolescents Questionnaire (MOHLAA-Q) for Malaysian Version (MyMOHLAA-Q)

Masitah Ahmad[1], Komathi Perialathan[2], Manimaran Krishnan[3], Teresa Sui Mien Yong[4], Nor Haryati Ahmad Sanusi[5], Khairul Amar Musa[6], Zamtira Seman[7], Mohammad Zabri Johari[8]

[1,2,3,4,5,8] Health Education Officer, Institute for Health Behavioural Research, National Institute of Health, Ministry of Health Malaysia

[5]Unit for Communication & Scientific Dissemination, National Institute of Health, Ministry of Health Malaysia

[6]Researcher, Institute for Health Behavioural Research, National Institute of Health, Ministry of Health Malaysia

[7]Sector for Biostatistics & Data Repository, National Institute of Health, Ministry of Health Malaysia

Abstract

It has been determined that health literacy (HL) plays a significant factor in health and becomes an essential element in health promotion. Most HL instruments are designed for adults, whereas only a few are developed for adolescents. Thus, utilizing the existing validated instruments to assess HL is essential for success in promoting HL from the early stages of life. The Measurement of Health Literacy Among Adolescents Questionnaire (MOHLAA-Q) was developed in Germany to assess self-reported general health literacy among adolescents. This study aims to validate health literacy using MOHLAA-Q, thus establishing it as the Malaysian version of MOHLAA-Q (MyMOHLAA-Q). Face validity and content validity were done on 29 items of MOHLAA-Q. MOHLAA-Q is divided into 4 sections − A) Information about Health, B) Communication about Health, C) Attitudes towards Health and 4) Knowledge about Topic Related to Health. During the pilot testing, MOHLAA-Q administration took ∼15 minutes of 229 respondents from rural and urban areas. The internal consistency coefficients (Cronbach's) for scales A−C ranged from 0.61 to 0.81. The final validated questionnaire is validated for 13 to 17-year-old Malay and English-speaking adolescents. The MyMOHLAA-Q experience allowed researchers to validate a measurement tool that can be used to assess health literacy among Malaysian adolescents.

Keywords: Health Literacy, Adolescent, Validation, Instrument, Questionnaire

1. Introduction

Various studies on health literacy have been done in Malaysia, however, they only look at adults or people with certain conditions such as obesity, mental illness, and other chronic illnesses. The first-ever national health literacy study among adult Malaysians was carried out in 2015 as part of the National Health and Morbidity Survey (NHMS) by the Malaysian Ministry of Health (MOH) [13]. In 2019, a health literacy

survey was carried out again by MOH through NHMS, targeting a population of adult respondents aged 18 years and above in Malaysia [12,20]. The ability of a society to make better decisions about its own and other people's health depends on the level of health literacy. This group does not only refer to adults but comprises adolescents. This group of age is still under research for health literacy not only in Malaysia, but worldwide [17]. Looking at the information about the health literacy level among adults, this is lacking among adolescents in Malaysia. Realizing the future role and responsibilities among adolescents, as they shall be the ones to establish and maintain the path of the healthcare system, it is crucial for this issue to be studied further. Health literacy is important at the adolescence stage because this is the life stage that skills are developed beyond the theoretical and practical knowledge, involving critical thinking, self-awareness, and the abilities necessary to be active citizens who take responsible actions to promote their own and others' health [16].

To assess the health literacy of Malaysian adolescents, MOH requires the appropriate instrument. Therefore, it is crucial for higher authorities such as MOH to gain an insight and monitor the Malaysian health literacy level across a wider range of scale including the adolescent population. This insight, which covers age, level of education, and socioeconomic status, can enhance the activities and initiatives by the ministry to raise health literacy among Malaysians. A few instruments for the health literacy designed focusing on adolescents widely known are Health Literacy Measure for Adolescents (HELMA) [9], Literasi Kesihatan Remaja Malaysia [1], Health Literacy for School-Aged-Children (HLSAC) [23] and Measurement of Health Literacy Among Adolescents Questionnaire (MOHLAA-Q) [7].

Our aim was to authenticate a self-administered, pencil-and-paper measuring instrument that may be used to monitor and assess health literacy with sizable adolescent populations. In social sciences, one of the most widely used instrument for data collection is questionnaire. Given the importance of questionnaires to research, it is critical to validate the questionnaires to produce high quality survey research. A validated questionnaire refers to the questionnaire that has been developed to be administered among the intended respondents and encompasses a representative sample of respondents, proving sufficient validity and reliability. A measurement instrument's integrity and quality can only be assured by providing proof of its validity and reliability [14].

2. Method

This paper details the process of validating the "Measurement of Health Literacy Among Adolescents Questionnaire" (MOHLAA-Q). This instrument being validated through a cross-sectional study that used the purposive sampling method. MOHLAA-Q had gone through multiple validation processes to be validated for use among adolescents in Malaysia prior to regeneration into MyMOHLAA-Q. This to guarantee the instrument is legitimate for assessing health literacy in adolescents. The validation is vital to ensure the questionnaire is psychometrically sound and able to measure what it intended. As shown in Figure 1, the design of this study involves two stages − Comprehension Level Evaluation and Pilot Test.

Figure 1: Study Design Flowchart
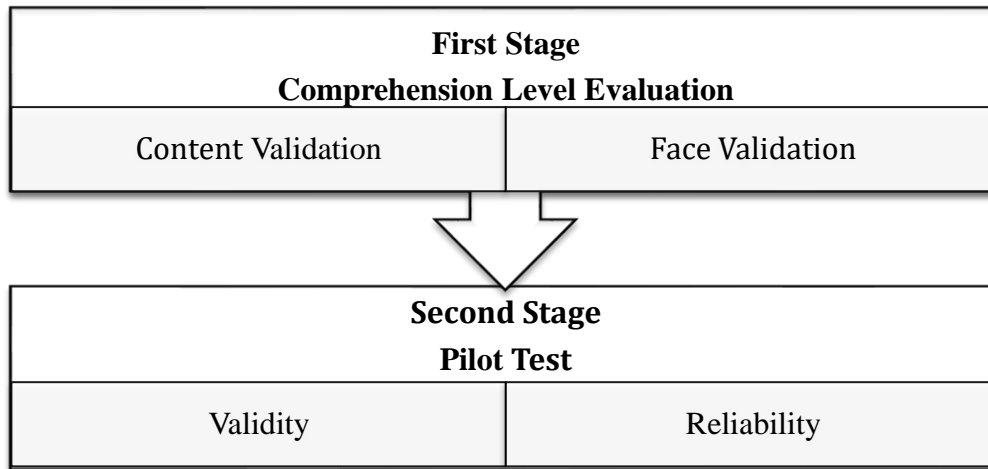
2.1 Measurement of Health Literacy Among Adolescents Questionnaire (MOHLAA-Q)

The German version of MOHLAA-Q instrument was created and validated by Domanska et al., 2020 for use among adolescents aged 14 to 17 [7]. MOHLAA-Q is a tool used to assess young people's generic multidimensional health literacy. Because of the way the questionnaire was created, it was reported that the questionnaire can be finished in less than fifteen minutes after being administered. MOHLAA-Q consists of four sections with 29 items in total − "Dealing with health-related information (HLS-EU-Q12-adolescents-DE)" in section A, "Communication and interaction skills" in section B, "Attitudes towards one's own health and health information" in section C, and "Health-related knowledge" in section D. For the Malaysian version, this instrument is meant for paper-based self-administered questionnaire. This quantitative questionnaire design enables the collection of generalised data to enable scoring for relevant questions as in Table 1.

Table 1: MOHLAA-Q Structure

SECTION A	SECTION B	SECTION C	SECTION D
Generic health literacy (HLS-EU-Q12-DE)	Communication	Attitude	Knowledge
Dealing with health-related information	Communication and interaction skills	Attitudes toward one's own health and health information	Health-related knowledge
Cognitive and behavioral	Behavior-communication	Affective and conative	Cognitive
12 item (*Likert scale*)	4 item (*Likert scale*)	5 items (*Likert scale*)	8 items (Yes or No)
Mean score (1-4)	Mean score (1-4)	Mean score (1-5)	Total marks (0-8)

2.1.1 MyMOHLAA-Q Validation Process

Step 1: Identification of sources and attaining permission

A thorough search was carried out to identify literature review containing terms and phrases that include 'health literacy, cognitive, affective, behaviour', 'teenagers', 'teen', 'adolescents' and 'instrument' by team members. Previous studies that related on adolescents' health literacy conducted in Malaysia, Southeast Asia, and worldwide were reviewed. Several Focus Group Discussions (FGD) series comprising four to six members each were conducted with stakeholders from 1) Ministry of Health such as Health Education Division to ascertain the focus areas of the intended instrument and 2 researchers who are not part of the study. Out of the various instruments been found, MOHLAA-Q seems fit to measure the health literacy level among adolescents in terms of time, length, succinctness, and feasibility. Written permission from the author of the MOHLAA-Q questionnaire was obtained with further details of the instruments.

Step 2: Translation

The MOHLAA-Q questionnaire was originally developed and validated in the German language. Thus, for Malaysian version, the English version provided was verified by a certified translator and high school English teacher. This aims to make the English language suitable for adolescents in Malaysia and meet the cultural language used by Malaysians at this age. Then, the English version of MOHLAA-Q was translated into Malay language. The same procedure was done, where two independent translators who are unaware of the English version of the MOHLAA-Q questionnaire, before being back-translated from Malay to English to ensure the accuracy of the translation. Finally, the research team members sat down to discuss and make an evaluation by looking at the comparison and suitability of the translation that has been implemented and make a decision on the results of the translation. A respondent is ought to complete a questionnaire in the language in which they are most familiar with. In Malaysia, the official and national language is Malay, or Bahasa Melayu, while English is the second language.

Step 3: Assessment of content validity, face validity, and refinement of the questionnaire

Content Validity: Content validity refers to how well the instrument evaluates the intended items in terms of wording and scoring. To start, experts and others who understand health literacy topic and adolescent health went through the MOHLAA-Q questionnaire, these individuals are referred to as Subject Experts (SE) [4]. Although the validation of the instrument is based on adopting/using the original MOHLAA-Q, the researcher consults and obtains input from SE. SE are involved in helping the research team by checking the appropriateness of the items in the potential instrument and evaluate the initial version of this instrument so that it is suitable for the Malaysian setting. Items are refined based on the culture and situational context for the Malaysian adolescent population as well as their relevance, clarity, simplicity, and brevity to the process and structure of the existing healthcare system in Malaysia. The SE panel of this project consists of a public health specialist, a family physician, a biostatistician, an academician in the field of research methodology, a psychologist, a health education specialist, a high school teacher, parents, and a linguist. They provided feedback on the development of the tool in terms of technical input and content validation process.

Face Validity: Next, the MOHLAA-Q went through face validity process. Face validity is a subset of content validity, refers to the extent to which a person (a layperson or an expert in the field) evaluates the material's applicability, relevance, and ease of comprehension before determining that the tool's items are valid to assess the topic of interest [10].

The MOHLAA-Q face validity was assessed by taking a purposive sample of 30 respondents from the target population of different ages (between 13 and 17 years old) and socioeconomic backgrounds to see the cognitive understanding (language, level of difficulty, clarity, relevance of questions) and ease of using the instrument. Purposive sampling criteria include 15 respondents from the urban localities and 15 respondents from the rural areas with a combination of 5 Malays, 5 Chinese, and 5 Indians. High school is the ideal location to gather responses from the targeted demographic of adolescents, who are between the ages of 13 and 17. To implement this, permission from the Ministry of Education (MOE) through the Educational Research Application System (eRAS 2.0) is obtained, as well as from the school principals who meet the criteria.

During face validity, MOHLAA-Q underwent cognitive testing. The goal of the session is to evaluate each participant's grasp, understanding, and interpretation of the questions as well as their clarity, relevance, and comprehension to measure the construct in the relevant domain. The questionnaire was distributed through in-person interviews. We also looked at how easy it is to follow the format's instructions and how long it typically takes to complete the questionnaire during the session.

Based on the participants' feedback, the questionnaire was revised, items were rearranged, and technical terms were swapped with the clearer ones. As a result, the items could be understood as intended, improving their readability and comprehension (layout and settings).

Figure 1: Face Validity Data Collection Flowchart
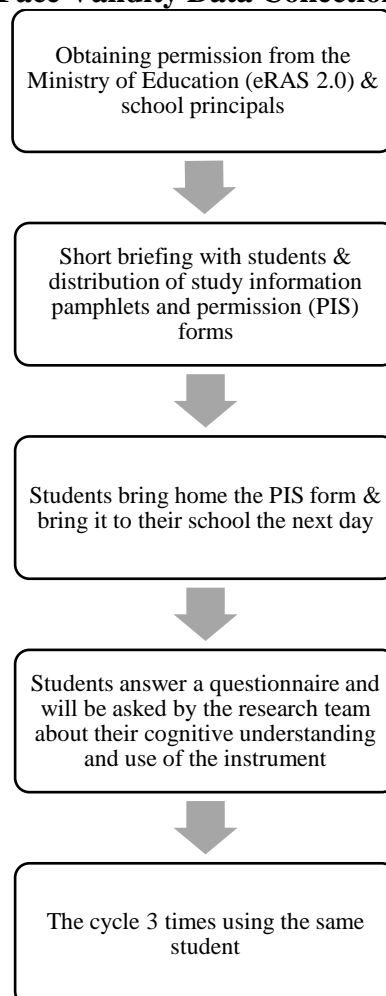
Step 4: Preparation for face validation and data collection procedure of the pilot study

Before the data collection, field guides were created to ensure a standard and ethical data collection procedures. Two training workshops were held by the research officers on data collection procedures. Data collection for face validation was conducted from February 1st to March 15th, 2023 (taking into account the need of 3 cycles and school break), and the pilot study took place from March 28th to 30th 2023.

To validate this questionnaire and take into consideration the process, both face validation and pilot tests were conducted in localities around Selangor, representing all the characteristics outlined in the sampling section. The face validation and pilot test were carried out in a high school located in Shah Alam, representing the adolescents in the urban settings, and another high school located in Sungai Buloh to represent adolescents in the rural areas.

Step 5: Pilot test

Pilot test is intended to "test the performance characteristics and capabilities of study designs, measures, procedures, recruitment criteria, and operational strategies that are to be used in subsequent studies, and generalisations on a larger scale" [21]. Sampling of the general population considers the variability of the population in general [28]. A pilot study's sample size should generally include at least 30 respondents [5,24]. Since reliability and validity analysis must be done, the pilot test sample size of this proposed project initially targets 200 respondents. Participants selected in this development process represent the main ethnicities, genders, levels of age, and population types (urban/rural), the tests were carried in the same localities as face validation.

Step 6: Validation of questionnaire

Validation of MOHLAA-Q were analysed using the Statistical Package for Social Sciences SPSS Version 23 for internal Consistency. Validity refers to the extent to which the instrument measures what it is supposed to measure [22].

3. Result

During the testing of pilot study, MOHLAA-Q (Malaysian version) administration took ~15 minutes with 229 respondents from rural and urban areas.

Internal consistency

Cronbach's coefficient was assessed to determine the internal consistency of the questionnaire. The score of reliability test for section A) Information about Health was 0.79 (12 items), section B) Communication about Health was 0.71 (4 items) and section C) Attitudes towards Health was 0.60 (5 items). The low Cronbach's alpha in the affective domain could be further improved by eliminating one of the items. The Cronbach's alpha values indicate an acceptable range of the instrument internal reliability.

Final questionnaire

The validated version of MOHLAA-Q, now known as the Malaysia Measurement of Health Literacy Among Adolescents Questionnaire (MyMOHLAA-Q), was submitted to a panel review before being used in the Malaysia Health Literacy Survey (MHLS) 2023.

Discussion

Given a few parameters such as time, length, succinctness, and feasibility, MOHLAA-Q is deemed appropriate to assess adolescents' health literacy in Malaysia. In comparison to other instruments, MOHLAA-Q, which consists of 29 items, is a succinct and compact tool that can assess risk behaviour, health communication abilities, and health information that is needed by the stakeholder. Another criterion is that MOHLAA-Q has the capacity to provide insight into adolescent health literacy, covering the primary function of the stakeholder as an implementer of health promotion and education. As part of the National Health Literacy Policy initiative, it was proposed that the health literacy measurement among adolescents be included in the Malaysia Health Literacy Survey (MHLS) 2023. MHLS will be administered as a population-based survey, therefore having an instrument that is neither overly long with a lot of items nor underwhelming few is essential. With the validated MOHLAA-Q, health literacy among adolescents in Malaysia can be measured with minimal difficulty and a shorter response time. This will have an impact on the survey's time, cost, and design. In fact, MOHLAA-Q is the finest option to fulfil the criteria, that lead to its selection.

The aim of this study is to describe the process of validating the existing questionnaire from other country into the Malaysia version. Apart from that, to produce a Malaysian version of the questionnaire in Malay and English languages, the MOHLAA-Q questionnaire was translated using strict standard translation criteria [3]. Few changes have been made throughout the three cycles of face validation phase when researchers received feedback on language from different groups. The changes take into account linguistic traits, linguistic adjustments, technical terminology, contextual translation, and local cultural adaptation. These specific adjustments are made based on the most well-known understanding of a particular phrase. After much discussion, the team members reached a colloquial term that is correct for the intended data collection while being not too technical or scientific, taking into account the age of the respondents as adolescents.

Cronbach's alpha, a frequently used statistic, measures the internal consistency of the scales and tests created or adopted to determine whether they serve the purposes for which they are designed. To determine if the MyMOHLAA-Q scale is reliable, Cronbach's alpha was used as this questionnaire has multiple questions with a Likert scale. Based on the result, MyMOHLAA-Q turned to be sufficient and exhibits greater reliability compared to the MOHLAA-Q in Sections A, B, and C. It is stated that the Cronbach's alpha coefficient of 0.7 or greater is acceptable, and thr cutoff value of 0.6 is acceptable for the newly created items [8,11,25,27]. The Cronbach's alpha values indicate acceptable range of the internal reliability of the instrument.

It appears that Sections A and B of MyMOHLAA-Q demonstrate acceptable and satisfactory internal consistency according to the Cronbach alpha values. Section A that covers general health literacy showed a Cronbach alpha value of 0.81, which is higher than the corresponding value of the MOHLAA-Q (0.77), indicating good reliability. Section A with 12 original items deals with health-related information derived from the Health Literacy Survey-European Union Questionnaire 12 − Adolescents in Germany (HLS-EU-Q12-Adolescent-DE). Section A is stable and functions well because the European Health Literacy Survey Questionnaire has been improved over time and has become a common tool to test health literacy (HL) [20]. Likewise, Section B, which retains 4 original items on health communication and skill, also displays acceptable internal consistency with a Cronbach alpha value of 0.71 compared to the MOHLAA-Q value of 0.58.

However, Section C, which highlights attitudes towards health and contains 5 items, exhibited a low reliability value with internal consistency (Cronbach's α) below the recommended threshold of 0.60. This suggests that the items in this section may not be measure the intended construct consistently or reliably. The original MOHLAA-Q also showed a lower reliability value in this section with a Cronbach's α of 0.54. Domanska et al., 2020 stated the findings of this section shows a similar result of low internal consistency with other instrument pertaining to attitude on health. The findings of MyMOHLAA-Q may be the same due to the complexity of the single components in seeking for health information (self-awareness, self-efficacy, motivation, etc.) as individuals below 18 years old are still under the responsibility of their parents/guardian. In Malaysia, a minor is someone who has not reached the 'age of majority'. The 'age of majority' is 18 years old and above according to the Age of Majority Act 1971 [1]. Likewise, the definition of a "child" in the Child Act 2001 is a person under the age of 18 years old, thus putting the minors under their parents/guardian responsibility and affecting the attitude [15].

MyMOHLAA-Q selection of the sample may be another factor contributing to the low internal consistency value, as faced by the original MOHLAA-Q. MyMOHLAA-Q sample of respondents are among students from two high schools in the Selangor state. Features in which the study sample of adolescents are from the same school group, same class or locality may play the role. In a relatively homogeneous sample with few individual differences, reliability may be worse than that of a heterogeneous sample with significant individual differences [6,7]. Also, low internal consistency index is the result of it being an adopted tool where the preliminary result of MyMOHLAA-Q is also low. It is recognised that the internal consistency index increases with the number of items in a scale, indicating that higher values correspond to higher item counts and can be biassed if the scale components are not fundamentally tau-equivalent (that is, do not have equal factor loadings) if there is not a single common factor evaluated [18,19,25,26,27]. Apart from the validation instrument, the results of the convergent validity for scale B and C should be interpreted with more caution, as only scale A meets the required threshold for internal consistency.

In section D, MyMOHLAA-Q represents health-related knowledge with 8 items. Health-related-knowledge is dynamic because it relies on new evidence gained from health sciences, health policy, and health system of the country which requires updates to the relevant items for the Malaysia version. Different from MOHLAA-Q, the Malaysian version was validated as paper-based self-administered questionnaires at school (educational setting) thus a measurement of this health literacy component in a population-based survey should focus on how data collection techniques ensure that respondents can answer the questions without any support of other persons or technical devices (which may cause measurement error and jeopardise the reliability of the measurement). Likewise, MyMOHLAA-Q faced similar challenge related to health-related knowledge due to culture and age, which is and practically relevant in the lives of Malaysian adolescents. At this juncture, the MyMOHLAA-Q is capable of assessing the needs of the intended study for the assessment of self-reported generic health literacy among 14- to 17-year-olds. In validating the Malaysian version of MOHLAA-Q, a multistep study design was design to ensure a theoretical and empirical foundation of the instrument. MyMOHLAA-Q acceptability and comprehensibility were adjusted accordingly the adolescents through cognitive testing of the MOHLAA-Q whereas the content validity was confirmed through the evaluation of the subject experts.

The findings of this validated Malaysia version of MOHLAA-Q have proven to be a feasible, valid, and reliable in assessing the general population of Malaysian adolescents in terms of cognitive, affective, and behaviour regarding health literacy and communication skills. The authors believe that this validated

designed instrument will contribute to the future research studies on the adolescents' level of health literacy and their communication skill on health.

For future studies, improvements can be occasionally made to ensure its relevance and applicability by taking into account the changing patterns of health education, health-related subjects that are offered at school, the latest government policy and the relevance of the submodules towards the adolescents in Malaysia or any population going to use the questionnaire.

Limitations

Sampling of the survey was conducted using a quota sampling procedure that is based on population parameters such as ethnicity and place/area of residence. As this is adopted version of MOHLAA-Q (which is only used in Germany), it required localised version to be made as the health literacy instrument among adolescents in Malaysia. Another limitation to this validation is language diversity. Indeed, the original version of MOHLAA-Q are in German Language and the English version are not validated. The MyMOHLAA-Q was contextually forward and back-translated from Malay to English and then back-translated to Malay. However, the contextual translation to other languages such as Mandarin, Tamil and others was not done, considering that Malaysia is has multiethnic groups. This may limit the use of the tool, but it is not expected to be too limiting since English and Malay are the most widely spoken language in the country. There will be some groupd of the population that will be excluded because of the language barriers..

Conclusion

This article describes the step-by-step process of validating the the Malaysian Version of Measurement of Health Literacy among Adolescents Questionnaire (MyMOHLAA-Q). MyMOHLAA-Q encounters similar challenge as MOHLAA-Q, where the requirement of achieving satisfactory internal consistency of all the various scales was not fully achieved. In fact, the Malaysian version also fulfils the highest criteria of construct validity in scale A, where the general health literacy items are derived from the HLS-EU-items. Thus, further revision and testing using other samples is necessary to re-examine the structural validity of MyMOHLAA-Q and to improve the internal consistency of items in Section B that covers "communication and interaction skills" as well as items in Section C that covers "attitudes towards one's own health and health information". The strength MyMOHLAA-Q is that it is tailored as much as possible to the health literacy traits of adolescence and goes beyond the perceived difficulties in dealing with health information, namely, by operationalising health-related communication as well as the affective and cognitive components of the health literacy. By integrating the tool with health-related knowledge questions, MyMOHLAA-Q reflects the multidimensionality of the health literacy construct, which is evident in the conceptualisation of generic health literacy among adolescents. To guarantee that the questionnaire is psychometrically sound, the validation phase is essential.

Declaration of competing interests

All the authors declare no competing interests.

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Credit authorship contribution statement

Masitah A is the main author who wrote the first draft and compiled the written sections of this manuscript. Yong TSM, Perialathan K, Ahmad M, Ahmad Sanusi NH, and Krishnan M, Seman Z and Musa KA interpreted part of the data, co-wrote sections of the manuscript, involve in validating process, and performing part of the data analysis. MZ Johari was responsible for the complete analysis, interpretation, refinement, and revision of the final draft of the manuscript.

Ethical Approval

This study has been approved by the Medical Research Ethics Committee (MREC), National Institute of Health (NIH) Malaysia, Ministry of Health, Malaysia. Respondents' anonymity and confidentiality were ensured during the course of the study. NMRR ID-22-00659-OCB.

References

1. Age of Majority Act (Act 21), 1974
2. Arif Shah, J. (2016). Developing a conceptual model of youth health literacy in Malaysia
3. Beaton, D. E., Bombardier, C., Guillemin, F., & Ferraz, M. B. (2000). Guidelines for the process of cross-cultural adaptation of self-report measures. Spine, 25(24), 3186–3191. https://doi.org/10.1097/00007632-200012150-00014
4. Bolger, F., & Wright, G. (1992.). Reliability and validity in expert judgment. In G. Wright, F. Bolger (Eds.), Expertise and decision support (pp. 47–76). Springer.
5. Browne RH. On the use of a pilot sample for sample size determination. Stat Med. 1995 Sep 15;14(17):1933-40. doi: 10.1002/sim.4780141709. PMID: 8532986.
6. Cathy King Pike & Walter W. Hudson (1998) Reliability and Measurement Error in the Presence of Homogeneity, *Journal of Social Service Research*, 24:1-2, 149-163, DOI: 10.1300/J079v24n01_07
7. Domanska OM, Bollweg TM, Loer AK, Holmberg C, Schenk L, Jordan S. Development and Psychometric Properties of a Questionnaire Assessing Self-Reported Generic Health Literacy in Adolescence. *Int J Environ Res Public Health*. 2020 Apr 21;17(8):2860. doi: 10.3390/ijerph17082860. PMID: 32326285; PMCID: PMC7216216.
8. Fan, Y., Zhang, S., Li, Y., Li, Y., Zhang, T., Liu, W., & Jiang, H. (2018). Development and psychometric testing of the Knowledge, Attitudes and Practices (KAP) questionnaire among student Tuberculosis (TB) Patients (STBP-KAPQ) in China. *BMC Infectious Diseases*, 18, 213.
9. Ghanbari, S., Ramezankhani, A., Montazeri, A., & Mehrabi, Y. (2016). Health Literacy Measure for Adolescents (HELMA): Development and Psychometric Properties. *PloS one*, 11(2), e0149202. https://doi.org/10.1371/journal.pone.0149202
10. Hardesty, D. M., & Bearden, W. O. (2004). The use of expert judges in scale development: Implications for improving face validity of measures of unobservable constructs. *Journal of Business Research*, 57(2), 98–107. https://doi.org/10.1016/S0148-2963(01)00295-8
11. Heale, R., & Twycross, A. (2015). Validity and reliability in quantitative studies. *Evidence-Based Nursing*, 18, 66–67

12. Institute for Public Health (IPH), National Institutes of Health, Ministry of Health Malaysia. 2020. National Health and Morbidity Survey (NHMS) 2019: Vol. I: NCDs – Non-Communicable Diseases: Risk Factors and other Health Problems

13. Jaafar N, Perialathan K, Krishnan M, Juatan N, Ahmad M, Mien TYS, Salleh KZ, Isa A, Mohamed SS, Hanit NHA, Hasani WSR, Mohamad EMW, Johari MZ. Malaysian Health Literacy: Scorecard Performance from a National Survey. *Int J Environ Res Public Health*. 2021 May 28;18(11):5813. doi: 10.3390/ijerph18115813. PMID: 34071455; PMCID: PMC8197907.

14. Kimberlin, C. L., & Winterstein, A. G. (2008). Validity and reliability of measurement instruments used in research. *American journal of health-system pharmacy: AJHP: official journal of the American Society of Health-System Pharmacists*, *65*(23), 2276–2284. https://doi.org/10.2146/ajhp070364

15. L Manizia and Ragini Mishra. A research study on adolescents attitude towards parental involvement in their everyday life. *The Pharma Innovation Journal*. 2021; 10(12S): 1934-1939

16. Manganello J. A. (2008). Health literacy and adolescents: a framework and agenda for future research. Health education research, 23(5), 840–847. https://doi.org/10.1093/her/cym069

17. Massey, P. M., Prelip, M., Calimlim, B. M., Quiter. E. S., & Glik, D. C. (2012). Contextualizing an expanded definition of health literacy among adolescents the health care setting. Health Education Research, 27(6), 961-974

18. Metaxas, C., Albert, V., Stahl, M., Hersberger, K. E., & Arnet, I. (2018). Development and validation of a questionnaire to self-assess patient knowledge of direct oral anticoagulants (KODOA-test). *Drug, Healthcare and Patient Safety*, 10(10), 69–77.

19. Mohamad, M. M., Sulaiman, N. L, Sern, L. C., & Salleh, K. M. (2015). Measuring the validity and reliability of research instruments. *Procedia Social and Behavioral Sciences*, 204, 164–171

20. Mohamad, E. M. W., Kaundan, M. K., Hamzah, M. R., Azlan, A. A., Ayub, S. H., Tham, J. S., & Ahmad, A. L. (2020). Establishing the HLS-M-Q18 short version of the European health literacy survey questionnaire for the Malaysian context. *BMC public health*, *20*(1), 580. https://doi.org/10.1186/s12889-020-08704-7

21. Moore, C. G., Carter, R. E., Nietert, P. J., & Stewart, P. W. (2011). Recommendations for planning pilot studies in clinical and translational research. Clinical and translational science, 4(5), 332–337. https://doi.org/10.1111/j.1752-8062.2011.00347.x

22. Naing, May Win; Liu, Yang; Sebastine, Immanuel; Dingmann, David; Williams, Chrysanthi; Williams, David (2013): Design and validation of a physiologically-adapted bioreactor for tissue engineering of the nucleus pulposus. Loughborough University. Journal contribution. https://hdl.handle.net/2134/14056

23. Paakkari O, Torppa M, Boberova Z, Välimaa R, Maier G, Mazur J, Kannas L, Paakkari L. The cross-national measurement invariance of the health literacy for school-aged children (HLSAC) instrument. *Eur J Public Health*. 2019 Jun 1;29(3):432-436. doi: 10.1093/eurpub/cky229. PMID: 30412226.

24. Sekaran, U., (2003). Research methods for business: A skill building approach. John Wiley & Sons.

25. Sharma, B. (2016). A focus on reliability in developmental research through Cronbach's Alpha among medical, dental and paramedical professionals. *Asian Pacific Journal of Health Sciences*, 3(4), 271–278

26. Tavakol, M., & Dennick, R. (2011). Making sense of Cronbach's alpha. *International journal of medical education*, 2, 53–55. https://doi.org/10.5116/ijme.4dfb.8dfd

27. Ursachi, G., Horodnic, I. A., & Zait, A. (2015). How reliable are measurement scales? External factors with indirect influence on reliability estimators. *Procedia Economics and Finance*, 20(2015), 679–686.

28. Yong TSM, Panting AJ, Juatan N, Perialathan K, Ahmad M, Ahmad Sanusi NH, Hassan L, Jahis R, Shamsudin N, Yap SL, Norshamsul NI, Pisol M, Johari MZ. Development and validation of a cognitive, affective and behaviour questionnaire on pet-associated zoonotic diseases (CAB-ZDQ). Vet Med Sci. 2021 Sep;7(5):1558-1563. doi: 10.1002/vms3.547. Epub 2021 Jun 16. PMID: 34137200; PMCID: PMC8464282.