

Readability and suitability of oral health education pamphlets produced by the Ministry of Health Malaysia

Siong Ting Wong, MDPH, Norkhafizah Saddki, MCommMed (Oral Health), Mon Mon Tin-Oo, MDS

School of Dental Sciences, Universiti Sains Malaysia, Health Campus, Kubang Kerian, Kelantan, Malaysia

ABSTRACT

Introduction: Printed health education materials can only be effective if they are readable and suitable for the target audience. This study examined the readability and suitability of oral health education (OHE) pamphlets produced by the Oral Health Program (OHP), Ministry of Health (MOH) Malaysia.

Methods: The Khadijah Rohani's Readability Formula (KRRF) and Suitability Assessment of Materials (SAM) instrument were used to assess the readability and suitability of the pamphlets respectively. All 23 Bahasa Malaysia pamphlets retrieved from the official portal of OHP on the 31st January 2019 were assessed for suitability. However, only five pamphlets were found to be eligible for readability assessment because the KRRF, the single formula available for Bahasa Malaysia text is applicable only for materials with 300 words or more. The readability is interpreted based on the level of formal education in Malaysia.

Results: All pamphlets achieved superior suitability rating with a minimum and maximum score of 75% and 95% respectively. However, a few pamphlets did not fulfil SAM superior and adequate criteria for the following factors and were rated not suitable: did not include summary (73.9%), have few or no headers (4.3%), did not use captions to explain graphics (17.4%), and did not provide interactive learning (21.7%). Readability of the pamphlets eligible for assessment ranged from primary six to secondary three.

Conclusions: OHE pamphlets produced by the MOH are readable by most Malaysians. Most pamphlets are generally suitable for the intended audience although a few performed poorly in several areas.

KEY WORDS:

Health education; oral health, pamphlets; readability; suitability; suitability assessment of materials; Malaysia

INTRODUCTION

Health education is an important health promotion element that aims to produce voluntary behaviour adaptations conducive for good health.¹ Printed materials such as booklets, brochures, flyers, and pamphlets are fundamental to many health education programs, and they are widely used to disseminate evidence-based information that can

increase knowledge or improve attitudes and skills of the target audience. Printed education materials can creatively combine written text, visual aids such as graphs, tables, charts, diagrams, and pictures, and visual cues like arrows, boxes, and bullets, such that health information can be communicated in an interesting way. They can reach a large number of people, and they can also be used by health professionals to deliver and reinforce important information to patients. Besides, they can be repeatedly looked at and referred to, which makes printed materials ideal as extended reminders of health messages.

Printed materials are useful only if they are readable by the target audience. Readability is the ease with which a reader can read the text² and this can be assessed using a readability formula. Examples of readily available readability formulas are Flesch Reading Ease Formula, Flesch-Kincaid Formula, Gunning Fog Index, Simple Measure of Gobbledygook, and Fry Readability Graph. These formulas, and most others, were developed for materials written in the English language. The only readability formula available to assess texts written in Bahasa Malaysia (BM) is the Khadijah Rohani's Readability Formula (KRRF), that was originally developed for evaluating textbooks used in Malaysian schools.³

Each of the readability formulas uses a different mathematical algorithm to compute a readability score based on basic semantic and syntactic elements in the text such as number of sentences, number of words, sentence length, number of syllables, and number of characters. The resultant score is usually converted to a reading ease score or reading grade level based on years of education. For instance, a text with readability level of grade nine indicates that the text can be easily read by a person who attained grade nine or higher, but it will be difficult for a person who had less than a ninth-grade education. Studies on patient education materials on various health topics showed that most materials were often written at readability levels too high for a substantial portion of the population.^{4,6}

Readability does not measure a persons' level of comprehension although it is often used as a guide to indicate comprehension. Readability is just one factor that affects the ease of understanding of what is being read. The extent of understanding and acceptance of information from printed materials can be influenced by many other factors that are not included in readability formulas.² These factors, which include the language used and its structure, content,

This article was accepted: 1 June 2019

Corresponding Author: Norkhafizah Saddki

Email: fihaz@usm.my

layout, instructiveness, as well as cohesiveness and organisation of information presented affect how suitable the printed materials are for the target audience.⁷ The formula also ignores literacy skills, cultural backgrounds and life experiences of readers. A large number of studies, including systematic reviews, have been undertaken to examine the suitability of health education materials. Findings of some studies indicated that there are numerous shortcomings related to certain aspects of suitability in most patient education materials, leading them to score only moderate to low ratings.⁸⁻¹¹

The objective of this study was to assess the readability and suitability of oral health education (OHE) pamphlets published by the Oral Health Program (OHP), Ministry of Health Malaysia (MOH) Malaysia. The OHP is the lead agency in matters pertaining to oral health care for the population which encompass implementation of oral health promotion and oral disease prevention programmes such as production of OHE materials. OHE materials published by the OHP include printable materials such as booklets, flip charts, pamphlets, posters, and flip charts, as well as audios, videos and multimedia materials. Of these, pamphlet is by far, the most common type of material produced. To the best of our knowledge, the readability and suitability of OHE pamphlets produced by the OHP, MOH have not been duly examined.

MATERIALS AND METHODS

Selection of pamphlets

From year 2006 onwards, OHE pamphlets produced by the OHP, MOH are made available to the public on the official OHP portal (<http://ohd.moh.gov.my/v3/index.php/en/downloads1/dhe-materials>). As of 31st January 2019, a total of 27 pamphlets were available for download by the public. Of these, 21 pamphlets were written in BM, one pamphlet was written in English, one was produced as a dual-language pamphlet containing BM and English text, and one was available in four languages; BM, English, Chinese and Tamil. In this cross-sectional study, we examined only pamphlets written in BM, which is the national language of Malaysia. All 23 BM pamphlets retrieved from the portal on January 31, 2019 were included in this study. Table I provides details of the pamphlets. This study was approved by the Universiti Sains Malaysia Human Research Ethics Committee [USM/JEPeM/15120533] and the MOH Medical Research and Ethics Committee [(5) KKM/NIHSEC/P16-46].

Readability assessment

Readability of the pamphlets was assessed using KRRF developed by Md Yunus, the only formula currently available to assess readability of BM text.³ The formula, that focuses on the construction of text, particularly the number of sentences, words, and syllables, is given as follows:

$$\text{Khadijah Rohani's Readability Level} = A - 13.988, \text{ where} \\ A = \left(\frac{\text{Number of words}}{\text{Number of sentences}} \times 0.3793 \right) + (\text{Number of syllables} \times 0.0207)$$

All mathematical operations were done by the main author. The readability level is interpreted based on the duration of formal education according to the Malaysian education system as given in Table II.¹² Resultant values which fall in

the middle of two readability levels such as 1.5 could be interpreted as being at the middle of primary one education level.¹²

The main drawback of the KRRF is that it is applicable only to passages with a minimum of 300 words. If the number of words in the text is less than 300, the resultant score would become negative and hence rendered irrelevant. Only five of 23 OHE pamphlets included in this study have 300 words or more and hence were eligible for readability assessment using the KRRF. The pamphlets were on the following topics: sensitive teeth (Pamphlet 1), endodontics treatment (Pamphlet 3), care for orthodontics appliances and teeth (Pamphlet 8), early detection of oral cancer (Pamphlet 10), and children's oral health (Pamphlet 13). The remaining 18 pamphlets were not tested for readability.

Suitability assessment

Suitability Assessment of Materials (SAM) instrument was used to evaluate the suitability of the pamphlets. Developed by Doak et al. in English,² the SAM instrument has been widely used to assess suitability of printed education materials for various health conditions including cardiovascular diseases, chronic kidney diseases, and rheumatic diseases.^{4,6,13} The original English version of SAM instrument has also been used to evaluate those materials in Spanish and Arabic.^{8,14}

The SAM instrument has 22 factors categorised into the following six evaluation criteria or components: content (4 factors), literacy demand (5 factors), graphics (5 factors), layout and typography (3 factors), learning stimulation and motivation (3 factors), and cultural appropriateness (2 factors). The content component of the SAM instrument assesses statement of purpose, content topics, scope, and presence of summary or review. The literacy demand component assesses readability grade level, writing style, vocabulary, sentence construction, and use of learning aids. The graphics component examines the cover graphic, type of illustrations, relevance of illustrations, explanation for graphics used, and use of captions. Factors under the layout and typography component assess layout factors, typography, and use of subheadings. The learning stimulation and motivation component assesses use of interactions, modelling of desired behaviour patterns, and motivation of readers based on use of subdivisions. Lastly, the cultural appropriateness component evaluates how well the material matches in logic, language and experience of intended audience and examines if cultural images and examples are presented positively and realistically. Each SAM factor was given the following scores and ratings: 0 = not suitable; 1 = adequate; and 2 = superior, depending on how well each factor meets the specified criteria. Factors that were not relevant to the material being assessed were recorded as "not applicable".

The content validity of SAM instrument was reviewed by a panel of experts consisting of two specialists in Dental Public Health, one MOH dental officer, and one researcher with experience in questionnaire adaptation and development. This process resulted in omission of one factor. Factor "reading grade level" under the literacy demand component was excluded because the readability formula used in the

Table I: Details of OHE pamphlets evaluated

Pamphlet	Title	Area of focus	Year of Publication	Edition
1	Gigi Sensitif	Sensitive teeth	2006	1st Ed.
2	Bilakah Anak Anda Perlu Memberus Gigi?	Toothbrushing in children	2007	2nd Ed.
3	Endodontik 'Rawatan Salur Akar Gigi'	Endodontics treatment	2007	1st Ed.
4	Masalah Karies Botol Susu	Nursing bottle caries	2007	3rd Ed.
5	Nafas Berbau?	Problem of bad breath	2007	1st Ed.
6	Pelindung Mulut	Use of mouth guard	2007	2nd Ed.
7	Penjagaan Kesihatan Pergigian Ibu Mengandung	Oral health care for pregnant mothers	2007	3rd Ed.
8	Rawatan Ortodontik - Ketahui Cara Penjagaan Apliance dan Kesihatan Pergigian Anda	Care for orthodontics appliances and teeth	2007	1st Ed.
9	Rawatan Ortodontik - Menyusun Gigi Menjadi Lebih Teratur	Orthodontics treatment	2007	1st Ed.
10	Pengesanan Awal Kanser Mulut - Melalui Pemeriksaan Mulut Sendiri	Early detection of oral cancer	2008	1st Ed.
11	Gunakan Ubat Gigi Berfluorida - Gigi Bersih, Sihat, Cantik Sepanjang Hayat	Fluoridated toothpaste	2009	1st Ed.
12	Varnis Fluorida Untuk Mencegah Kerosakan Gigi	Fluoride varnish application	2010	1st Ed.
13	Kesihatan Pergigian Kanak-kanak	Children's oral health	2011	1st Ed.
14	Anda Tidak Terkecuali Daripada Menghidapi Kanser Mulut	Early signs of oral cancer	2013	2nd Ed.
15	Amalan Berisiko Tinggi Kanser Mulut	High risk habits for oral cancer	2013	2nd Ed.
16	Kesihatan Periodontium	Periodontal health	2013	3rd Ed.
17	Kurangkan Pengambilan Gula	Reducing sugar intake	2013	2nd Ed.
18	Nikmati Makanan Anda	Health eating	2013	2nd Ed.
19	Panduan Penjagaan Gigi Warga Emas - Kekalkan Senyuman Sepanjang Hayat	Oral health care for elderly	2013	1st Ed.
20	Panduan Penjagaan Mulut Untuk Pesakit Berkeperluan Khas	Oral hygiene care for individuals with special needs	2014	1st Ed.
21	Panduan Untuk Penjaga - Gigiku Mutiaraku Buat Permata Istimewa	Oral health care for individuals with special needs – guide for carers	2014	1st Ed.
22	Venir Pergigian - Mencipta Senyuman Anggun	Dental veneers	2014	1st Ed.
23	Pastikan Anda Selamat – Kenali Doktor Gigi Anda	Illegal dental practices	2016	1st Ed.

Table II: Readability level according to the Khadijah Rohani's readability formula and the corresponding education level and duration of formal education in Malaysia

Readability level	Primary or secondary level	Duration of formal education
1	Primary 1	1
2	Primary 2	2
3	Primary 3	3
4	Primary 4	4
5	Primary 5	5
6	Primary 6	6
7	Secondary 1	7
8	Secondary 2	8
9	Secondary 3	9
10	Secondary 4	10
11	Secondary 5	11

SAM instrument, the Fry Readability Formula, was designed for English text, and is not suitable to evaluate BM text. A study in Saudi Arabia that evaluated suitability of patient health education materials in Arabic using SAM instrument also excluded this factor.⁸ Besides, in the current study, readability of the pamphlets was assessed separately using the KRRF. Hence, in this study, only 21 of the 22 original SAM factors were used.

Two reviewers were invited to rate the pamphlets, both were dentists with at least five years of working experience, with doctorate qualification in Dental Public Health, and were fluent in BM and English. Both of them were MOH staff and were not involved in development of the pamphlets. The

reviews were done independently. Following this assessment, a meeting was held with the reviewers to examine any disagreement in factor rating. Responses that substantially differed were deliberated on to achieve consensus.

A SAM percent score for each pamphlet was then calculated. This was done by summing up the factor-list scores (excluding "not applicable" factors) and dividing it by the highest possible score. Suitability rating for each SAM evaluation component was also calculated using the same method. The resultant SAM percent scores were given ratings as follows: superior (70-100%), adequate (40-69%), and not suitable (0-39%).²

Table III: SAM percent score and SAM rating for each OHE pamphlet

Pamphlet	Title of pamphlet	SAM percent	SAM rating score (%)
1	Gigi Sensitif	88	Superior
2	Bilakah Anak Anda Perlu Memberus Gigi?	88	Superior
3	Endodontik 'Rawatan Salur Akar Gigi'	75	Superior
4	Masalah Karies Botol Susu	88	Superior
5	Nafas Berbau?	90	Superior
6	Pelindung Mulut	75	Superior
7	Penjagaan Kesihatan Pergigian - Ibu Mengandung	90	Superior
8	Rawatan Ortodontik - Ketahui Cara Penjagaan Apliance dan Kesihatan Pergigian Anda	90	Superior
9	Rawatan Ortodontik - Menyusun Gigi Menjadi Lebih Teratur	93	Superior
10	Pengesanan Awal Kanser Mulut - Melalui Pemeriksaan Mulut Sendiri	88	Superior
11	Gunakan Ubat Gigi Berfluorida - Gigi Bersih.Sihat.Cantik Sepanjang Hayat	85	Superior
12	Varnis Fluorida Untuk Mencegah Kerosakan Gigi	85	Superior
13	Kesihatan Pergigian Kanak-kanak	89	Superior
14	Anda Tidak Terkecuali Daripada Menghidapi Kanser Mulut	85	Superior
15	Amalan Berisiko Tinggi Kanser Mulut	88	Superior
16	Kesihatan Periodontium "Gusi umpama tiang seri, rosak gusi robohlah gigi"	93	Superior
17	Kurangkan Pengambilan Gula	88	Superior
18	Nikmati Makanan Anda	76	Superior
19	Panduan Penjagaan Gigi Warga Emas - Kekalkan Senyuman Sepanjang Hayat	88	Superior
20	Panduan Penjagaan Mulut Untuk Pesakit Berkeperluan Khas	95	Superior
21	Panduan Untuk Penjaga - Gigiku Mutiaraku Buat Permata Istimewa	90	Superior
22	Venir Pergigian - Mencipta Senyuman Anggun	87	Superior
23	Pastikan Anda Selamat – Kenali Doktor Gigi Anda	90	Superior

Table IV: Suitability rating for each SAM evaluation component

SAM evaluation component	Frequency (%)		
	Superior	Adequate	Not Suitable
Content	18 (78.3)	4 (17.4)	1 (4.3)
Literacy Demand	21 (91.3)	2 (8.7)	0 (0.0)
Graphics	22 (95.7)	1 (4.3)	0 (0.0)
Layout and Typography	22 (95.7)	1 (4.3)	0 (0.0)
Learning Stimulation and Motivation	17 (73.9)	6 (26.1)	0 (0.0)
Cultural Appropriateness	23 (100.0)	0 (0.0)	0 (0.0)

Statistical Analysis

IBM SPSS Statistics Version 22 was used to process the collected data for generation of descriptive statistics: frequency, proportion (%), mean percent, standard deviation (SD), and maximum and minimum mean percent.

RESULTS

Readability of the pamphlets, which were eligible for assessment using the KRRF was as follows: Pamphlet 1 (sensitive teeth): level 8, Pamphlet 3 (endodontics treatment): level 7, Pamphlet 8 (care for orthodontics appliances and teeth): level 9, Pamphlet 10 (early detection of oral cancer): level 6, and Pamphlet 13 (children oral health): level 8. In general, the readability ranged from level 6 to level 9 which is equivalent to primary six (Standard 6) to secondary three (Form 3).

All 23 pamphlets were rated as superior based on their respective SAM percent scores (Table III). The minimum score was 75% and the maximum score was 95%. The mean overall SAM percent score for all OHE pamphlets was 87% (SD = 5.2%).

The suitability ratings of each SAM evaluation component are given in Table IV. The contents of most pamphlets (78.3%) were rated as superior. Additionally, most pamphlets were rated superior for their literacy demand (91.3%), graphics (95.7%), and layout and typography (95.7%). Almost three-quarters of the pamphlets (73.9%) were rated superior for learning stimulation and motivation, and all pamphlets achieved superior rating for cultural appropriateness. However, further analysis of individual factor scores revealed that a few pamphlets did not receive suitable score in the following SAM factors: summary, learning aids, captions, and interactions. The suitability ratings of individual SAM factors are shown in Table V.

DISCUSSION

According to Doak et al., patient education materials should be written at no higher than grade 6 reading level.² This grade 6 is based on the United States education system, and it is equivalent to primary six or Standard 6 in Malaysia which is the final year of elementary or primary school. The majority of Malaysian population (91%) had completed at least primary school while the remaining 9% never had any formal schooling.¹⁵ Of those who completed at least primary school, 15% completed only primary school, 61% progressed

Table V: Suitability rating for individual SAM factor

SAM evaluation component and factors	Frequency (%)			
	Superior	Adequate	Not Suitable	Non-Applicable
Content				
Purpose	19 (82.6)	4 (17.4)	0 (0.0)	0 (0.0)
Content topics	20 (87.0)	3 (13.0)	0 (0.0)	0 (0.0)
Scope	22 (95.7)	1 (4.3)	0 (0.0)	0 (0.0)
Summary and review	0 (0.0)	6 (26.1)	17 (73.9)	0 (0.0)
Literacy Demand				
Writing style	22 (95.7)	1 (4.3)	0 (0.0)	0 (0.0)
Vocabulary	20 (87.0)	3 (13.0)	0 (0.0)	0 (0.0)
In sentence construction	15 (65.2)	8 (34.8)	0 (0.0)	0 (0.0)
Learning aids	18 (78.3)	4 (17.4)	1 (4.3)	0 (0.0)
Graphics				
Cover graphic	19 (82.6)	4 (17.4)	0 (0.0)	0 (0.0)
Type of illustrations	22 (95.7)	1 (4.3)	0 (0.0)	0 (0.0)
Relevance of illustrations	21 (91.3)	2 (8.7)	0 (0.0)	0 (0.0)
Graphics explained	0 (0.0)	2 (8.7)	0 (0.0)	21 (91.3)
Use of captions	8 (34.8)	11 (47.8)	4 (17.4)	0 (0.0)
Layout and Typography				
Layout	23 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)
Typography	22 (95.7)	1 (4.3)	0 (0.0)	0 (0.0)
Use of subheadings	22 (95.7)	1 (4.3)	0 (0.0)	0 (0.0)
Learning Stimulation and Motivation				
Use of interaction	0 (0.0)	18 (78.3)	5 (21.7)	0 (0.0)
Behaviours are modelled	22 (95.7)	1 (4.3)	0 (0.0)	0 (0.0)
Motivation	23 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)
Cultural Appropriateness				
Cultural match	23 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)
Cultural images and examples	21 (91.3)	0 (0.0)	0 (0.0)	2 (8.7)

to secondary school, and 15% attained tertiary education.¹⁵ These statistics and our results indicate that at least about three-quarters of Malaysian population would be able to read the OHE pamphlets produced by the MOH without difficulty.

Although readability level which corresponds to education level or duration of formal education is not a reliable indicator of a persons' ability to comprehend a written material and use the information to promote and maintain good health, readability is undeniably an important prerequisite. Additionally, there is considerable evidence to suggest that education level is an important social determinant of health and health behaviours including engagement in risky health practices and use of preventative health care services.^{16,17} The association between education level and oral health status and behaviour was clearly demonstrated in the latest oral health survey among adults in Malaysia. Prevalence of dental caries, deep periodontal pockets and prosthetic treatment needs were shown to be significantly higher among adults with lower secondary school education (secondary three) or below compared with those who completed upper secondary school (secondary five) and tertiary education.¹⁸ The proportion of Malaysian population who sought oral health care in the past year was also lowest among adults with lower secondary education or below compared with individuals who progressed through to the upper-secondary level and those with tertiary education.

A revision of OHE pamphlets that have readability level beyond primary six is therefore recommended to ensure individuals with lower educational attainments can read the materials with ease.

While it is important to improve readability of printed materials, it does not guarantee that the materials are suitable for the target audience because readability and suitability do not necessarily go hand in hand. Some materials are easy to read but not superior in its suitability for the target audience,^{6,9} and some materials are superior in its suitability but not easily read by the target audience.^{19,20} In agreement, our pamphlets that have readability level beyond primary six could score as high as 90% on the suitability scale.

It is important that patient education materials are not only written at a level that is readable for individuals with low reading skills, but also suitable for the given patient population. All 23 OHE pamphlets evaluated in this study were rated as superior in its suitability. However, further analysis of the suitability rating revealed that some pamphlets actually received only adequate or even not suitable rating in certain SAM evaluation criteria and factors.

Most OHE pamphlets reviewed in this study explicitly stated their purpose in the title or introduction, provided behaviour

focused content that clearly stated the desirable actions patients should take to solve their problems, and limited their scope to essential messages directly related to the set purpose. On the other hand, almost three-quarters of the pamphlets did not provide summary or review, and hence were rated not suitable for this factors. Others provided only revision of key ideas and received adequate rating. Inclusion of a summary or review of key facts is important to highlight the essential information that patients must remember after reading the material.⁹ Not only repetition and reinforcement can improve learning, repeated and reinforced messages have also been shown to play a crucial role in sustaining positive behaviour changes following health education intervention programs.²¹

All except one pamphlet were categorised as superior in the writing style. That one pamphlet that received adequate rating used passive voice in about half of the text. Passive voice sentences never identify the doer of the action, hence contributing to the ambiguity of the health messages. On the other hand, a sentence that is written in an active voice is stronger because it clearly identifies the action and who is performing that action. Using active voice helps to ensure effective communication by giving the responsibility of performing the action to the patient.

Use of jargon, technical, or scientific language should be limited, and if used, they should first be defined and explained in simple language that the patient will understand.² Few OHE pamphlets used dental jargons such as dental veneer and tooth whitening that were not adequately explained. However, these were not extensive, and thus the pamphlets were rated adequate. Similarly, several pamphlets did not provide context before new information, but this only occurred in about half of the time, and the pamphlets were also rated adequate. Learning aids or organizational tools such as headers or topic captions are used in printed education materials to tell readers what to expect in that section. While most pamphlets have informative headers in nearly all sections, one pamphlet had no header and was rated not suitable.

People usually remember pictures better than words.^{22,23} This phenomenon is called the picture superiority effect. The effect has been used to improve health communication, and it can be especially useful for people with low literacy skills.²⁴ The SAM instrument assesses 5 graphics components: cover graphic, type of illustrations, relevance of illustrations, explanation for graphics used, and use of captions. Most OHE pamphlets assessed in this study have friendly, clear, and attractive cover graphics, simple and easily recognised illustrations that are relevant and sufficient. Only two pamphlets used graphics (in particular tables and charts) to reinforce the content being presented. However, the explanations given were too brief such that it was difficult for readers to understand the graphics. Additionally, most pamphlets had either only brief captions to explain some illustrations and graphics or do not use captions at all. OHE materials with lack of appropriate captions should be revised because a graphic without a caption indicates a missed learning opportunity for patients.² Appropriate use of graphics in patient education has been shown to be beneficial. Pictures in medication labels and information

sheets can enhance the comprehension of instructions and adherence to medications,²⁵ and graphic warnings placed on cigarette packs can increase the awareness of the public of the harmful effects of tobacco.²⁶ Graphic warning labels on cigarette packs were also able to promote neural activation in areas of the brain involved in cognitive and affective decision-making and memory formation,²⁷ and can successfully discourage smoking initiation and increase quitting intentions, quit attempts, and successful smoking cessation.²⁸⁻³⁰

Layout and typography have substantial influence on suitability of a material.² A material that is poorly formatted will not be visually appealing to readers such that it may not be read despite having high-quality content.³¹ All OHE pamphlets assessed in this study fulfilled at least 5 of 8 superior layout factors concerning placement of illustrations, sequence of information, line length, contrast between paper and type, paper surface quality, and use of visual cues, white space, and colour supports as suggested by Doak et al.² Typography is the art and technique of arranging type to make written words visually appealing and legible for all individuals regardless of their literacy skills. Choice of typeface or font type, case type, point size, and cues are among the most important typographic considerations to be taken into account. A material with superior typography should use uppercase and lowercase serif or sans-serif fonts of at least 12 point, with no more than five font types and point sizes on a page.² Additionally, long headers or running text should not be written with all letters capitalised, typographic cues such as bold, colour, and italic should be included to emphasize main points.² Most OHE pamphlets in this study were rated superior in typography. Similarly, most pamphlets received superior rating for use of descriptive subheadings that break or 'chunk' the material into short sections of no more than five items. Use of subheadings to break up information into sections of information that are relatively short will prevent information overload and make the content easily read and understood, and enable people with low literacy skills to better recall the information read.²

None of OHE pamphlets assessed in this study received superior rating for the use of interaction. Instead, most pamphlets used passive interaction with question-and-answer format to discuss problems while others did not provide interactive learning stimulation at all. Materials with superior interactions will include instructions that stimulate readers to interact with the material, encouraging them to participate in their own health care. Interactions in form of questions or problems that require responses of the readers such as solving the problems, making choices, or demonstrating a procedure, will enhance transfer of learning and lasting retention of information.² Webber et al., who performed a quasi-experimental trial on cardiomyopathy patients to investigate the effects of using interactive booklets on recall of information reported an improved recall in patients who read booklet containing adjunct questions compared to those who read booklet with plain text.³² Additionally, a randomised controlled trial on asthmatic patients showed that an intervention program that requests patients to make a contract to adopt a behaviour they think can improve their asthma in addition to receiving a

workbook, weekly reinforcements for 12 weeks, and frequent follow-up visits, was associated with improved patient self-management and self-efficacy.³³

Materials that enable development of self-efficacy can promote positive health behaviour and informed decision-making. Self-efficacy is one's belief in his or her own ability to carry out influencing decisions in life to accomplish a task and achieve intended results.³⁴ Besides influencing how people feel and think, and behave, self-efficacy beliefs determine how people motivate themselves in learning.² Contents of all OHE pamphlets assessed in our study were subdivided into small parts to create opportunities for achievable behaviour changes and small successes, hence were rated superior for SAM individual factor on motivation. Additionally, desired behaviour patterns were modelled in nearly all OHE pamphlets assessed in this study. People often learn more readily when specific instructions on the desired behaviours or skills are given.² Behavioural approaches have been successfully applied to printed health education materials used in health education intervention. A randomised controlled trial showed that incorporation of behaviour change strategies into the development of printed materials used in the intervention was the most cost-effective approach to changing behaviour, which was to get a group of women to register for Pap Test Reminder Service, compared to use of other combination of approaches.³⁵

Patient education materials are considered culturally appropriate when the words and pictures used are culturally sensitive and similar to the logic, language, and experience of the target readers.² A study in the United States showed that socioeconomically deprived African Americans were more likely to adopt positive behaviour change advocated by printed cancer education materials if the messages were conveyed in a culturally sensitive manner tailored to this group, by utilizing images of African American people and symbols.³⁶ Malaysia is a multi-ethnic country. Approximately half of the population are Malay, with large minorities of Chinese, Indians, and the indigenous Bumiputra.³⁷ While these various ethnic communities maintain their own original and separate cultural identities, the groups have lived alongside each other for many generations and the integration have created a unique Malaysian culture.³⁸ The main concepts of all OHE pamphlets assessed in this study were relevant to the Malaysian culture and context, and thus were rated as superior. Besides having concepts that match the logic, language and experience of the Malaysian population, images of people, costume, setting, food, and paraphernalia featured in most pamphlets were culturally relevant and represent the Malaysian culture in positive and realistic manners.

This study has several limitations. First, we evaluated the current OHE pamphlets that were available in softcopy and downloadable from the official portal of OHP, MOH. We did not assess the printed OHE materials published more than 10 years ago, with contents that may already be obsolete, but were still available at MOH facilities and hence read by patients. The KRRF that is applicable only for text with minimum of 300 words posed another limitation in this study because not all pamphlets could be evaluated for readability.

This readability formula only considered criteria such as number of words and number of syllables in determination of readability grade level, which is one of the limitations of readability formulas.³⁹ Besides, common assumption that shorter words with less syllables are more understandable than longer words with more syllables may not be relevant for medical and dental terms.⁴⁰ A new readability formula should be developed for medical text. This formula should have no lower or upper limit for number of words since patient education materials range widely from brief fact sheets to large booklets.

Despite being the most commonly used assessment tool for suitability of printed educational materials, the scoring process of SAM instrument is inherently subjective for the majority of evaluation criteria, hence allowing certain level of freedom in the interpretation and subsequent scoring. The potential for bias in rating cannot be ignored. The range for the three overall SAM rating classifications is relatively wide: superior 70-100%, adequate 40-69% and not suitable 0-39%. This may result in considerable variations of materials been classified under similar suitability rating. Another limitation of the SAM instrument is that it does not evaluate the quality and scientific accuracy of the information presented in the materials.

CONCLUSION

The readability level of OHE pamphlets produced by the OHP, MOH are appropriate for most Malaysian population, although a few pamphlets may be quite difficult for individuals with lower educational attainments. The suitability of the pamphlets is superior with a mean overall SAM percent score of 87%. Shortcomings requiring revisions and improvements were highlighted. Findings of the current study also underlined the importance of incorporating readability and suitability assessment during material development, contrary to the current practice that assesses the materials only after they have been circulated for use. Additionally, a new readability formula for BM text that has no lower or upper word count limit should be developed so that all printed patient education materials can be assessed accordingly.

ACKNOWLEDGMENTS

We would like to thank the Director General of Health Malaysia for the permission to conduct this study and to publish this article. We would like to thank the Oral Health Program, Ministry of Health Malaysia (MOH) for use of their pamphlets. This study was funded by the Universiti Sains Malaysia Research University grant (1001/PPSG/812155).

REFERENCES

1. Dickinson AO. Community Oral Health Education. In: Mason J, editor. *Concept in Dental Public Health*. 2nd ed. Philadelphia: Lippincott Williams & Wilkins; 2010: 139-57.
2. Doak CC, Doak LG, Root JH. *Teaching Patients with Low Literacy Skills*. 2nd ed. Philadelphia: J.B. Lippincott; 1996.
3. Md. Yunus KR. *An Assessment of Structural Variables in Malay: A Readability Formula [Dissertation]*: University of Miami; 1982.
4. Tuot DS, Davis E, Velasquez A, Banerjee T, Powe NR. Assessment of printed patient-educational materials for chronic kidney disease. *Am J Nephrol* 2013; 38(3): 184-94.

5. Boles CD, Liu Y, November-Rider D. Readability levels of dental patient education brochures. *J Dent Hyg* 2016; 90(1): 28-34.
6. Rhee RL, Von Feldt JM, Schumacher HR, Merkel PA. Readability and suitability assessment of patient education materials in rheumatic diseases. *Arthritis Care Res (Hoboken)* 2013; 65(10): 1702-6.
7. Johansson K, Salanterä S, Katajisto J, Leino-Kilpi H. Written orthopedic patient education materials from the point of view of empowerment by education. *Patient Educ Couns* 2004; 52(2): 175-81.
8. Jahan S, Al-Saigul AM, Alharbi AM, Abdelgadir MH. Suitability assessment of health education brochures in Qassim province, Kingdom of Saudi Arabia. *J Family Community Med* 2014; 21(3): 186-92.
9. Ryan L, Logsdon MC, McGill S, Stikes R, Senior B, Helinger B et al. Evaluation of printed health education materials for use by low-education families. *J Nurs Scholarsh* 2014; 46(4): 218-28.
10. Weintraub D, Maliski SL, Fink A, Choe S, Litwin MS. Suitability of prostate cancer education materials: applying a standardized assessment tool to currently available materials. *Patient Educ Couns* 2004; 55(2): 275-80.
11. Finnie RK, Felder TM, Linder SK, Mullen PD. Beyond reading level: a systematic review of the suitability of cancer education print and Web-based materials. *J Cancer Educ* 2010; 25(4): 497-505.
12. Yusoff M. Strategi Pengajaran Bacaan dan Kefahaman: Ke Arah Kemantapan Pembelajaran di Sekolah Menengah [Teaching Strategies for Reading and Understanding: Towards Strengthening of Learning at Secondary School]. Kuala Lumpur: Dewan Bahasa dan Pustaka; 1999.
13. Hoffmann T, Ladner Y. Assessing the suitability of written stroke materials: an evaluation of the interrater reliability of the suitability assessment of materials (SAM) checklist. *Top Stroke Rehabil* 2012; 19(5): 417-22.
14. Howe CJ, Barnes DM, Estrada GB, Godinez I. Readability and suitability of Spanish language hypertension and diabetes patient education materials. *J Community Health Nurs* 2016; 33(4): 171-80.
15. Ministry of Education Malaysia. Malaysia Education Blueprint 2013 - 2025 (Preschool to Post-Secondary Education). Putrajaya: Ministry of Education Malaysia; 2013.
16. Hahn RA, Truman BI. Education improves public health and promotes health equity. *Int J Health Serv* 2015; 45(4): 657-78.
17. Feinstein L, Sabates R, Anderson TM, Sorhaindo A, Hammond C, Eds. What are the effects of education on health? Social Outcome of Learning Project Symposium; 2006; Copenhagen, Denmark: Organisation for Economic Co-operation and Development (OECD), Centre for Educational Research and Innovation (CERI).
18. Ministry of Health Malaysia. National Oral Health Survey of Adults 2010 (NOHSA 2010). Kuala Lumpur, Malaysia: Oral Health Division, Ministry of Health Malaysia; 2013.
19. Kang E, Fields HW, Cornett S, Beck FM. An evaluation of pediatric dental patient education materials using contemporary health literacy measures. *Pediatr Dent* 2005; 27(5): 409-13.
20. Tian C, Champlin S, Mackert M, Lazard A, Agrawal D. Readability, suitability, and health content assessment of web-based patient education materials on colorectal cancer screening. *Gastrointest Endosc* 2014; 80(2): 284-90.
21. Haleem A, Khan MK, Sufia S, Chaudhry S, Siddiqui MI, Khan AA. The role of repetition and reinforcement in school-based oral health education-a cluster randomized controlled trial. *BMC Public Health* 2016; 16: 2.
22. Defetyer MA, Russo R, McPartlin PL. The picture superiority effect in recognition memory: A developmental study using the response signal procedure. *Cognitive Development* 2009; 24(3): 265-73.
23. Whitehouse AJO, Maybery MT, Durkin K. The development of the picture-superiority effect. *British Journal of Developmental Psychology* 2006; 24: 767-73.
24. Houts PS, Doak CC, Doak LG, Loscalzo MJ. The role of pictures in improving health communication: a review of research on attention, comprehension, recall, and adherence. *Patient Educ Couns* 2006; 61(2): 173-90.
25. Katz MG, Kripalani S, Weiss BD. Use of pictorial aids in medication instructions: a review of the literature. *Am J Health Syst Pharm* 2006; 63(23): 2391-7.
26. Jung M. Implications of graphic cigarette warning labels on smoking behavior: An international perspective. *J Cancer Prev* 2016; 21(1): 21-5.
27. Green AE, Mays D, Falk EB, Vallone D, Gallagher N, Richardson A, et al. Young adult smokers' neural response to graphic cigarette warning labels. *Addict Behav Rep* 2016; 2: 28-32.
28. Blanton H, Snyder LB, Strauts E, Larson JG. Effect of graphic cigarette warnings on smoking intentions in young adults. *PLoS One* 2014; 9(5): e96315.
29. Villanti AC, Cantrell J, J.L P, D.M V, J.M. R. Perceptions and perceived impact of graphic cigarette health warning labels on smoking behavior among U.S. young adults. *Nicotine Tob Res* 2014; 16(4): 469-77.
30. Brewer NT, Hall MG, Noar SM, Parada H, Stein-Seroussi A, Bach LE, et al. Effect of pictorial cigarette pack warnings on changes in smoking behavior: a randomized clinical trial. *JAMA Intern Med* 2016; 176(7): 905-12.
31. Arnold CL, Davis TC, Frempong JO, Humiston SG, Bocchini A, Kennen EM, et al. Assessment of newborn screening parent education materials. *Pediatrics* 2006; 117(5 Pt 2): S320-5.
32. Webber D, Higgins L, Baker V. Enhancing recall of information from a patient education booklet: a trial using cardiomyopathy patients. *Patient Educ Couns* 2001; 44(3): 263-70.
33. Mancuso CA, Sayles W, Allegrante JP. Randomized trial of self-management education in asthmatic patients and effects of depressive symptoms. *Ann Allergy Asthma Immunol* 2010; 105(1): 12-9.
34. Bandura A. Self-efficacy: toward a unifying theory of behavioral change. *Psychol Rev* 1977; 84(2): 191-215.
35. Paul CL, Redman S, Sanson-Fisher RW. A cost-effective approach to the development of printed materials: a randomized controlled trial of three strategies. *Health Educ Res* 2004; 19(6): 698-706.
36. Black B. The community cancer detection, education, and prevention demonstration projects for socioeconomically disadvantaged populations: lessons learned-cancer screenings in underserved populations. Atlanta, GA: American Cancer Society; 1995.
37. Current population estimates, Malaysia, 2016-2017 [press release]. Kuala Lumpur, Malaysia: Department of Statistics, Malaysia 2017.
38. Ibrahim R. Multiculturalism and education in Malaysia. *Culture and Religion* 2007; 8(2): 155-67.
39. Janan D, Wray D. Readability: The limitations of an approach through formulae. *British Educational Research Association Annual Conference*; 4-6 September 2012; University of Manchester 2012.
40. Huang G, Fang CH, Agarwal N, Bhagat N, Eloy JA, Langer PD. Assessment of online patient education materials from major ophthalmologic associations. *JAMA Ophthalmol* 2015; 133(4): 449-54.