

## Readability and Suitability Evaluation of Educational Media Regarding Men's Secondhand Smoke on Pregnant Wives

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### ABSTRACT

**Introduction:** The tools for assessing the appropriateness of educational materials are measuring device. Suitability offers a systematic approach to objectively assessing the appropriateness of health information material for a specific audience. The present study is designed to evaluate the readability and suitability of educational media about regarding men's secondhand smoke (SHS) in the smoker men on their the exposure of pregnant wives.

**Methods:** This analytical cross sectional study was done from October to December 2018 in Isfahan, Iran. Participants were in two groups. The first group of educational media audience consisted of 20 smokers with a pregnant wife. The second group was 15 people from the panel of experts. Written educational media (pamphlets) were evaluated. The readability of the material was measured by "readability assessment of materials" (RAM) and suitability was retrieved through "suitability assessment materials" (SAM). The Gunning-Fog Index was used to assess the readability of the media and the cloze test was used to assess the educational level of the media. Descriptive indices were stated for all variables. The collected data were analyzed by SPSS18.

**Results:** The readability mean score of the educational material was  $16.60 \pm 1.34$  for pamphlet, which was acceptable ( $\text{score} > 10$ ,  $P < 0.001$ ). Results showed the percentage points SAM score for the pamphlet was 85%. The educational material for media was "excellent" on the SAM rating. The score of the Gunning-Fog index for pamphlets was 9.6 and equivalent to the third grade of guidance was obtained. According to the evaluation by cloze test, pamphlet learning was assessed as an independent training without the need for a teacher.

**Conclusions:** The printed materials were well-matched after evaluation by the RAM and the SAM checklist, the Gunning-Fog Index and the cloze test. They were consistent with the characteristics of smoker men.

**Keywords:** Readability, Suitability, Educational Media, Secondhand Smoke, Pregnant Women

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## Introduction

Secondhand exposure to cigarette smoke involves inhaling smoke from cigarette and exhaling the inhaled smoke(1, 2). In the world, more than 35% of non-smokers, 33% of non-smokers and 40% of children are exposed to second-hand smoke (SHS) (3-5). In Iran, about 56.2% of pregnant women are exposed to SHS(6). The rate of secondhand smoke exposure in pregnant women in Isfahan was 23.1%(7). SHS serious side effects for pregnancy such as preterm labor (8-12), rupture of membranes(13), increased cesarean operation(9), decreased growth of fetus, delayed intrauterine growth(8, 12, 14), low birth weight of fetus(8, 10-12), distressed fetus(10, 11), small embryo compared to the gestational age(9), sudden infant-death syndrome(8, 12), and increased level of cotinine in follicular fluid (15). Although smoking rates for Iranian women are low, the high prevalence of cigarette smoking among Iranian men creates exposure to secondhand smoke, an important risk factor for women's health(16). Depending on the type of target audience, educating regarding the dangers of secondhand smoke and its prohibition at the community level is associated with reduced exposure to secondhand smoke at home(17). Effective interventions are needed to reduce secondhand smoke exposure in pregnant women to ensure fetal and maternal health. The content of the training material should be for both pregnant women and their husbands(5). this type of training program is also important and cost effective(18). Readability of educational material means estimating the likelihood of the reader being successful in reading and understanding a text or paper and identifying factors that make understanding the text easy or difficult. This is an important issue in content analysis research(19). Previous studies have shown that readability and suitability of the educational material may increase the likelihood of readers' perception and recall (20, 21).. The tools for assessing the appropriateness of educational materials are readability and suitability. Readability refers to the difficulty or ease degree of reading educational media.

However, readability is not enough alone to improve understanding. Suitability offers a systematic approach to objectively assess the appropriateness of health information material for a specific audience in a short term(20). Therefore, the present study is designed to evaluate readability and suitability of educational media regarding secondhand smoke in men with respect to their pregnant wives.

## Methods

### Study design and participants

This cross sectional study was done from October to December 2018 in Isfahan, Iran. Participants were randomly assign in two groups. According to the type of study and based on a similar study Sadeghi et al.(21), authors selected the sample size. The first group of educational media audience consisted of 20 smoker men with a pregnant wife. They were selected randomly and voluntarily from patients in Isfahan's health centers. The second group was 15 people from the panel of expert. It included eight experts from health education, one from epidemiology, four, from the reproductive health field, one psychologist and one, from health promotion. In this study, the training package included lectures, educational pamphlets, animations, fetal photographs, reminder messages, and training o women as educational assistants. Training was provided in health centers. The content of all the items overlapped, and written educational media (pamphlets) were evaluated.

The educational content was obtained based on a review of texts, papers, opinions of experts and the educational content of WHO. The educational content contained information on childbirth and pregnancy, cigarette smoke, and the diagnosis of all types of smoke and second-hand smoke complications for pregnancy and fetuses, and recommendations for protection against smoke.

In order to evaluate the educational material, researchers used readability and suitability tools. The readability of the material was assessed by RAM and suitability by SAM. The Gunning-Fog

Index was used to assess the readability of the media, and the cloze test was used to assess the educational level of the media. Initially, the educational materials were assessed by specialists. Then, according to their view, essential changes were made and the media were adjusted according to the target group. The training materials were then returned to the target group, and the suitability and readability were assessed again.

### **Readability Assessment of Materials (RAM)**

RAM assesses the difficulty of reading an educational medium in three parts: having a specialized content (range of scores 0 - 6), misspelling (range of scores 0 - 6), and typical mistakes (range of scores 0 - 6). The range of scores in media readability assessment is from 0 to 18, and the acceptable score is more than 10(21).

### **Suitability assessment of materials (SAM)**

SAM was used to control suitability, a score that takes into account features such as content, graphics, layout / topography, and cultural suitability(20). SAM incorporates other variables into its assessment. It rates written materials based on 22 issues grouped in 6 categories: “content”, “literacy demand”, “graphics”, “layout and typography”, “learning stimulation and motivation”, and “cultural appropriateness”. Each factor is valued as excellent (2 points), suitable (1 point), or not suitable (0 points) (26). Factors that do not apply to the material are rated not applicable. The total score is 44. The scores for each item are then summed to yield the total SAM score. After that, the total score is divided by the total SAM score and reported in percentage. The material was rated as not suitable (0% - 39%), suitable (40% - 69%), or excellent (70% - 100%) (27). Calculation method: (sum of scores of items) divided by (total number of items) multiplied by 100.

### **Gunning-Fog Index**

The Gunning-Fog score (GFS) is calculated using the number of polysyllabic words and average sentence length (i.e., those with three or more syllables)(22). The index was designed by Robert Gunning-Fog in 1951 to evaluate and

determine the readability of textbooks based on formal education classes. In other words, the main purpose of this index is to evaluate and classify the content of books. It answers the question of which educational content is appropriate for which formal education curriculum. The process and method for determining the readability of entries in the Gunning Index are as follows:

- 1- Select a sample of one hundred words from the beginning, a sample of one hundred words from the middle, and a sample of one hundred words from the end of the text at random.
- 2- Count the number of sentences from each sample according to three indices (.,? And!).
- 3- Calculate the average sentence length by dividing the number of words by the number of complete sentences in each sample of one hundred words
- 4- Count the number of three-syllable words and more than three syllables available (difficult words) in each one-hundred-word text.
- 5- Add the number of difficult words to the average number of words in the sentences.
- 6- Multiply by the sum of the number of difficult and average words in sentences with a fixed number of 0.4.
- 7- Perform calculations of paragraphs 4, 5, 6 for two samples of one-hundred- word.
- 8- Calculate the mean of the results of all three samples by adding and dividing by number.

The score obtained from the above operations in paragraph eight indicates which content is appropriate for the level of formal education. The degrees of the Gunning index is equivalent to formal classes. Therefore, the numbers 2, 3, 4 and ... are equivalent to the second, third and fourth grades ...(19, 23).

### **Cloze Test**

This method was introduced by Wilson Tyler in 1953 at the University of Illinois. It is a holistic approach and a Gestalt method for evaluating textbooks in terms of independent education, level of stress and education. In other words, it is possible to understand the level of texts in books.

Therefore, it determines whether content can be learned for students without the help of a teacher or they need teachers? Was the text difficult for learners and their learning was accompanied by stress? The process of evaluating and analyzing content in this index is as follows:

- 1- Select several texts from content which learners have not read yet.
- 2- Write the first sentence of each text in its entirety and in its original form.
- 3- Empty one word out of five words in the selected text as dots.
- 4- The number of vacancies can range from 20, 25, 50, 75, 100 depending on the learner's ability.
- 5- Distribute dotted texts, among the learners, to write the most appropriate concept in the blank.
- 6- Collect and correct papers, give them a score, and convert it to a percentage.
- 7- Conclude based on the percentage of scores.

If the average of the correct answers is between 0-40%, authors can conclude that the text is at the level of stress and despair. Accordingly, learners cannot read and understand the material correctly. If the average of the correct answers is between 40-60%, the text is at the educational level, and learners are able to understand with the help of a teacher. If the average of correct answers is between 60- 100%, the text in question is independent, and learners can learn it without the help of a teacher or others(19, 23).

**Statistical Analysis**

The normality of the data was checked with

Kolmogorov Smirnov test and it showed normal distribution of data. Data was analyzed using SPSS 18 and descriptive statistics tests.

**Ethical approval and consent to participate**

Yazd,ethics committee affiliated with Shahid Sadoughi University of Medical Sciences approved this study (reference number **IR.SSU.SPH.REC.1396.133**). It is in compliance with the Helsinki Declaration. Informed and written consent was obtained from participants. Study has been registered in the Iranian Registry of Clinical Trials, **IRCT20180722040555N1**.

**Results**

The mean readability score of the educational material was 16.60±1.34 for pamphlet, which was an acceptable score (Table1).

Results revealed that percentage points SAM score for the pamphlet was 85%, and the educational material was “excellent media” on the SAM ratings (Table 2).

The Gunning-Fog index score for pamphlets was 9.6. This was equivalent to the third grade of middle school (Table3). One of the inclusion criteria in the intervention study for using this educational media is having a minimum level of literacy (third grade of middle school), and it corresponds to this index.

Percent of Cloze test was 94% and between 60-100%. Therefore, pamphlet learning was assessed as an independent training without the need for a teacher (Table4).

**Table 1.** Mean Score of the "Readability Assessment of Materials" and items

Items	Specialty and Functionality (Difficulty)	Editorial errors	Spelling errors	Total Score	Min	Max	P.value	t
Mean ± SD	4.80± 1.40	5.80± 0.63	6.00± 0.00	16.60± 1.34	14	18	0.000	38.88

The range of scores in media readability assessment: 0-18  
 The acceptable score: > 10

**Table 2.** Results of the Assessment Pamphlet SAM Score Check List

No	SAM item and description	Mean ± SD	
1	Content	a. Purpose is evident	2.00± 0.00
		b. Content about behavior	1.70± 0.48
		c. Scope is limited	1.40± 0.69
		d. Summary or review included	1.70± 0.48
2	Literacy demand	a. Reading grade level	1.80± 0.42
		b. Writing style, active voice	1.80± 0.42
		c. Vocabulary uses common words	1.70± 0.48
		d. Context is given first	1.60± 0.51
		e. Learning aids via “road signs”	1.40± 0.69
3	Graphics	a. Cover graphic shows purpose	1.60± 0.69
		b. Type of graphics	1.55± 0.72
		c. Relevance of illustrations	1.90± 0.31
		d. List, tables, etc. explained	1.57± 0.78
		e. Captions used for graphics	1.80± 0.42
4	Layout and typography	a. Layout factors	1.90± 0.31
		b. Typography	1.80± 0.42
		c. Subheads (chunking) used	1.70± 0.67
5	Learning stimulation, motivation	a. Interaction used	1.70± 0.48
		b. Behaviors are modeled and specific	1.77± 0.44
		c. Motivation – self-efficacy	2.00± 0.00
6	Cultural appropriateness	a. Match in logic, language, experience	1.90± 0.31
		b. Cultural image and examples	1.90± 0.31
Total score earned by SAM		37.40± 3.43	
Percentage points earned by SAM		***85%	
*Not suitable (0% - 39%), **suitable (40% - 69%), ***Excellent (70% - 100%)			

**Table 3.** Results of the Gunning-Fog Score (GFS) for pamphlet

Written material	First Text	Second Text	Third Test
Score of calculated	7.6	9.2	12
Mean(grade)	9.6equivalent to ninth grade (third-grade middle school)		

**Table 4.** Results of the Cloze test for pamphlet

Cloze test	Number of blank	Mean ± SD	Percent	Evaluation
Percent and score of Cloze test	25	0.94 0.04	94%	between 60-100% independent training without the need for a mentor

**Discussion**

A huge amount of money is spent on the production of educational media, and in fact, it is based on the needs and cultural characteristics of the audience. Educational media are different and it is the duty of educators to inform the audience(24). Standard educational materials are essential for effective education. According to the

needs and level of learners, educators should consider the most effective type of media and teaching method. The present study was conducted with the aim of determining the readability and appropriateness of educational media about cigarette smoke in men with pregnant wives.

Readability is easy when the reader can understand the written text. In this study,



readability analysis showed that most of the primary content was written at a lower reading level than recommended by the audience. Okuhara et al.'s study(25) in Japan conclude that educational material is useful on cancer screening announcements in municipal newspapers. Study finding was consist with Rhee et al. in the USA about the educational material about rheumatic diseases(20). The results of Sadeghi et al.'s study(21) in evaluating SAM and RAM of educational media for adolescents in Iran regarding hookah prevention were in line with this study. TRAM for the educational pamphlet after the reform it was score of 15, which was acceptable. However, the results of Walsh and Volsko in the USA about the readability assessment of internet-based consumer health data(26), is not consistent with this study and the educational material assessed from their study was poorly readability and included in the "difficult" media group.

The SAM is a valid tool in evaluating the written health of educational materials and examines printed materials to increase people's understanding based on known factors.(27). In this study, the average SAM score was acceptable and media suitability was categorized as "excellent". Hoffmann et al.'s study in Australia found that printed content increased people's understanding of stroke and was consistent with our findings when examining the appropriateness of written educational materials. Finnie et al. in a systematic review showed that only two out of seven print and web-based articles were appropriate for cancer education.(28). The results of Sadeghi et al.'s study(21) concerning SAM and RAM of hookah prevention's educational media in adolescents in Iran were in line with this study. The SAM for educational pamphlet after the reform was 90% and at an excellent level regarding media level. In Rhee et al.'s study, the SAM for educational materials for patients with rheumatic diseases, was suitable (20). However, in a study by Vallance et al., RAM and SAM for materials on physical activity was poor and not suitable(29).

The Gunning-Fog score for the pamphlet was 9.6 and equivalent to the third grade of middle school.

According to the evaluation by cloze test, pamphlet learning was assessed as an independent training without the need for a teacher. In the study by Kher et al., several indicators were used to evaluate the readability of online educational media for congestive heart failure patients. one of them was the Gunning-Fog index with a score of 11/95(30).

Therefore, in facilitating learning and remembering information, modifying and evaluating written educational materials according to the target audience is very important. One of the limitations of this study was that readability was evaluated only for printed materials. Evaluating electronic and audio-visual media is also effective in improving content. The authors also suggested that careful planning should be done for the production and distribution of educational media according to readability standards. In addition, health care providers involved in the preparation of educational materials should be properly trained for this purpose.

### Conclusions

The printed materials were well-matched after evaluation by RAM and SAM checklist, the Gunning-Fog index and cloze test. They were in accordance with the characteristics of the smoker men. Paying attention to these recommendations can increase the likelihood of patients' understanding.

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### Author contribution

All authors were involved in study conception, design, drafting of the manuscript, ZK, VA, and FA were involved in write and revise the manuscript. All authors have read and approved the final version of the manuscript.

### Conflict of interest

Authors declare no conflict of interests.

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