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Preventing Pregnant Women's Exposure to Secondhand Smoke: Development and Suitability Assessment of an Educational Comic Booklet

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Abstract

Aim: The aim of this mixed methods research was to develop an educational comic booklet to prevent pregnant women's exposure to secondhand smoke. **Methods:** We assessed the suitability of the comic booklet by measuring participant response to content, literacy demand, graphics, layout and typography, learning stimulation, motivation, and cultural appropriateness. The participants were 17 Indonesians living in Japan who were recruited through Respondent-Driven-Sampling and met all criteria for the survey. Means and standard deviations were used to determine the suitability of the educational comic. **Results:** About 80% of participants rated the comic as "superior" on a rating scale with options of "superior", "adequate", "not suitable", or "not applicable". The most successful aspects of the comic were content and cultural appropriateness, as it provided clear contents and the graphics showed realistic Indonesian smoking behavior. The least successful aspect of the comic was the literacy demand because there were long sentences using difficult words. **Conclusions:** The results of this study may be used to conduct a randomized controlled trial using this comic booklet with some modifications.

Keywords

Comic Booklet, Health Education, Indonesia, Pregnant Women, Secondhand Smoke

1. Introduction

Indonesia is a lower-middle-income country, in which 67% of the men are daily smokers [1]. This creates a high exposure to secondhand smoke (SHS) for women during pregnancy, which has a negative impact on both the pregnant women and their fetuses [2]. In 2017, Suzuki [3] found that husbands smoking in the home exposed 69% of pregnant women to SHS. This indicates a great need for evidenced-based, targeted, and culturally relevant health education using a knowledge translation model.

This study had two objectives: 1) the development of a culturally appropriate health educational comic booklet (ECB) drafted in Indonesian and based on the Health Belief Model (HBM), and 2) the assessment of the draft's feasibility using the Suitability Assessment of Materials (SAM). This study is the initial phase towards a randomized controlled trial to prevent SHS at home for pregnant Indonesian women.

Background

Knowledge translation (KT) is an emerging model designed to bring the use of evidence into practice, that is, to close the "know-do" gap [4]. Fundamental processes of KT are "developing understandable and actionable messages, accommodating the context of a target audience's information needs, and delivering messages in cost-effective ways" [[5], p.213].

Paling [6] reported that the properly interpreted Paling Perspective Scale is for laypeople having high numeracy or mathematical literacy. This ECB provides health messages on the perceived severity and harmful influence on pregnant women and their fetuses with a modified Paling Perspective Scale that uses numerical displays and visual support for people with low numeracy.

Infographics, such as illustrations and graphs, have become popular tools to communicate complex ideas to learners by providing understandable and actionable messages. Moll [7] examined educational text with illustration that assisted in the recall of educational content for patients with osteoarthrosis (OA). Moll [7] found that patients exposed to illustrated educational booklets demonstrated significantly higher mean recall scores [(n = 373) = 63.7 (±2.69), p < 0.001)] compared with those who were not exposed [(n = 31) = 35.5 (±6.35)]. "The rationale for a comic book format was to visually attract, illustrate graphically, and use storytelling as a method of generating interest while educating" [[8], p.2]. The strength of using a comic format is that learners remember more information if text is followed by key illustrations [9] [10]. In health settings, using illustrated story-based (comic) material for adults is becoming a common approach [11]-[16]. However, to our knowledge, there are no comic-style educational materials for promoting SHS prevention in pregnancy. It is critical to combine a client decision-making model, such as the HBM that embodies KT processes with an infographic presentation to reduce or eliminate SHS during pregnancy.

To capture cultural relevancy in an infographic presentation, the culture must be understood. Indonesians are generally aware of the dangers of tobacco smoke and SHS, such as lung cancer and heart and throat diseases. However, some smokers living in a place with smoke-free regulations may feel that a smoke-free policy is an infringement of human rights [17]. Both Kaufman *et al.* [17] and Nichter *et al.* [18] found that among Indonesian men, smoking had great personal and socio-cultural importance. Moreover, Indonesian people generally think that smoking helps control anger [18]. When we develop SHS educational material targeting men, we must consider men's culture and social values, and reasons for smoking, and we must address how those cultural values affect their health behavior [19].

The HBM is a client decision-making model that addresses the clients' social values and health needs [20]. The development of health education material based on the HBM has been successfully used in multi-cultural Malaysia [21]. In previous experimental research for preventing SHS in pregnancy in two very different cultures, both Taiwan and Iran followed the HBM and confirmed that using the HBM had positive results on behavior change [22] [23]. The HBM shows promise for KT in situations where there may be a paucity of educational material.

2. Methods

2.1. The Development of an Educational Comic Booklet

2.1.1. Research

We searched Google for websites and research references from reputable organizations about SHS with the following keywords: "NCSCT", "WHO", "NHS", "NHS inform", "CDC", "estimate of secondhand smoke", "burden of disease from secondhand smoke", "secondhand smoke in pregnancy", "smoke-free home", "smoking in pregnancy", and "passive smoking". Research references were derived from PubMed after searching for the following keywords: "maternal secondhand smoke exposure and pregnancy health", "smoke-free home", "tobacco and Indonesia". All materials and research references described above were accessed from May 2018 to July 2018.

2.1.2. Coding Educational Contents According to Health Belief Model Components

Based on the retrieved educational materials and research references, material contents were coded by use of the components of the HBM [20]. We categorized the educational contents according to the six HBM constructs: perceived severity, susceptibility, benefits, barriers, cues to action, and self-efficacy.

2.1.3. Making a Draft of An Educational Comic Booklet

We developed a proposal for the ECB using strategies to enhance cultural appropriateness (**Table 1**) [19], and this proposal was checked by an educational advisor. The proposal was submitted to a well-known Japanese illustrator who had

Table 1. Application of Kreuter *et al.*'s strategies for enhancing cultural appropriateness[a].

Strategy	Definition	Examples in this comic booklet
Peripheral strategies	To develop programs or materials on the cultural appropriateness by packaging them in ways likely to appeal to a given group	Skin color, and hair color of target group were adopted into the comic character.
Evidential strategies	To enhance the perceived relevance of a health issue for a given group by presenting evidence of its impact on that group	Passive smoking rate in a target group was mentioned. Harmful influence on pregnant women and fetus were described as impact on target group.
Linguistic strategies	To make health education programs and materials more accessible by providing them in the dominant or native language of the target group	A bilingual translator translated the material from Japanese to Indonesian, then the material in Indonesian was back-translated into Japanese using Google translation.
Constituent-involving strategies	To draw directly on the experience of members of the target group	Scene of antenatal care, and exposure to secondhand smoke in the comic were drawn as experience of target members.
Socio-cultural strategies	Health-related issues in the context of broader social and/or cultural values and characteristics of the intended audience	Tobacco smoking plays an important role for Indonesian men in social activities. Therefore, the smoking role for Indonesian men was drawn in the comic.

[a]Kreuter, M.W., Lukwago, S.N., Bucholtz, D.C., Clark, E.M. and Sanders-Thompson, V. (2003) Achieving Cultural Appropriateness in Health Promotion Programs: Targeted and Tailored Approaches. *Health Education and Behavior*, 30(2), 133-146.

experience in successfully drawing educational comics about health. The illustrator made a draft of the ECB in Japanese.

2.2. Assessment of the Suitability of the Educational Comic Booklet draft

2.2.1. Design

Mixed methods research was conducted with qualitative and quantitative data gathered from participants who completed a questionnaire survey. This study was approved by the Research Ethics Committee of St. Luke's International University, Tokyo (18-A066).

2.2.2. Sample

The participants were recruited from the population of Indonesians living in Japan. The following inclusion criteria were used: participants could read and understand English, and they were aged 18 years or above. Respondent-driven sampling was used because the candidates who met these requirements were hard to find and recruit in Japan. We recruited Indonesian participants to account for inter-observer variability [24]. The process of recruitment and scoring is described below:

1) The researcher or two Indonesian research collaborators sought out participants who met our inclusion criteria through social networks.

2) The researcher or the same collaborators then asked the participant how many other possible participants they knew.

3) The researcher or collaborators then asked the original participant to confirm whether the other possible participants agreed to participate in our research.

4) The researcher or collaborators obtained 25 possible participants' email ad-

dresses or telephone numbers from the original participant.

5) The researcher or research collaborators explained the purpose and the method of research to the target population prior to the research via email or telephone, using three forms: request form, consent form, and withdrawal form.

6) The researcher posted a draft of the developed ECB, questionnaire, request form, consent form, withdrawal form, and a reply envelope with a stamp and the researcher's address.

7) The researcher instructed participants how to evaluate the material in the "Instructions for Suitability Assessment" of an ECB for preventing secondhand smoke for pregnant women in their homes.

8) The participants assessed the suitability of the developed material independently for each question, rating it as 0 (not suitable), 1 (adequate), or 2 (superior). "Not applicable (N/A)" could be used if the question or factor did not apply to the material.

9) The scored questionnaire was sent back to the researcher.

2.2.3. Measures

The SAM tool created by Doak *et al.* [25] was used to assess the suitability of the ECB's draft. SAM has 22 items categorized into six domains. Content is rated as 0 (not suitable), 1 (adequate), or 2 (superior). The total possible score is 44; a score of 0 to 17 is considered as "not suitable", 18 to 30 is "adequate", and 31 to 44 is "superior". The measure has been validated and is widely used [24] [26] [27] [28].

2.2.4. Analysis

The mean SAM scores were used to determine the suitability assessment of the material based on the works of Rhee *et al.* [27] and Tian *et al.* [24]. The mean and standard deviation were used to determine the suitability of each domain and for each SAM item.

3. Results

3.1. Development of Educational Comic Booklet

A total of 17 educational resources were used. The majority (n = 10) were from various reputable organizations [29]-[38]. Research references (n = 7) providing information about health effects of SHS were selected to promote smoke-free homes for pregnant women [2] [18] [39] [40] [41] [42] [43]. Educational content was coded into the five components of the HBM (**Table 2**). The five components were defined and linked to the educational content as follows.

3.1.1. Perceived Susceptibility

Perceived susceptibility is defined as "one's belief regarding the chance of getting a condition (e.g. define population at risk, risk level)" [[20], p. 49]. There were two areas of perceived susceptibility in this study: the possibility of exposure to SHS [29] [37] [39] [40] [41] and physiological processes by which SHS can affect

Table 2. Coding guide and educational contents based on the health belief model.

Component	Definition	Contents
Perceived susceptibility	One's belief regarding the chance of getting a condition	**Possibility of exposing SHS**[a] Even if you are a non-smoker staying with a smoker, you inhale side-stream smoke and you exhale the smoke from a smoker. It is secondhand smoke. **Procedure of the effects of SHS for pregnant women and fetus** 1. Pregnant woman inhale tobacco smoke. 2. Some toxic substances such as nicotine and carbon monoxide enter their body. 3. Blood vessels of pregnant women and umbilical cord contract by pharmacological action of nicotine. 4. Carbon monoxide combines with hemoglobin over oxygen as priority. Therefore, necessary oxygen does not circulate through the body. 5. Fetus will lack oxygen and nutrition.
Perceived severity	One's belief of how serious is the condition is and its sequelae	**Harmful influence of SHS for pregnant women** Early delivery/perinatal depression/suicidal ideation. **Harmful influence of SHS for fetus** Congenital malformation/low birth weight infant/stillbirth/small for gestational age.
Perceived benefits	One's belief in the efficacy of the advised action to reduce risk or seriousness of impact	**Quitting paternal smoking can bring the following benefits** 1. Save fetus and pregnant woman's health from harmful influence of smoke. 2. Reduce incidence rate of chronic diseases such as heart disease and diabetes for fetus. 3. Reduce incidence rate of diseases such as respiratory disease and cardiovascular disease. 4. Save money. 5. Prevent conflagration.
Perceived barriers	One's belief about the tangible and psychological costs of the advised action	1. Tobacco smoke, which remains on the wall or furniture keeps emitting some toxic substances. 2. When you smoke on the lower floor, tobacco smoke moves into the upper floor as per smoke's characteristics. 3. Cigarette butts and live cigarettes emit increased side-stream smoke. 4. Conflict between smoker and non-smoker at home. 5. Smoking visitors at home.
Cues to action	Strategies to activate one's readiness	Over 70% pregnant women are exposed to secondhand smoke from their husband. The following recommendations for preventing secondhand smoke exposure at home are proposed: 1. Perceived barriers; 2. Use educational material; 3. Inform husbands who smoke that pregnant women do not want to inhale secondhand smoke; 4. Make non-smoking day at home; 5. Remember reasons why pregnant women want to stop secondhand smoke exposure; 6. Stick a poster for non-smoking at home in a conspicuous place; 7. Recommend husbands to quit smoking tobacco; 8. Urge husbands to smoke outside the home.

[a]SHS = secondhand smoke.

pregnant women and fetuses [33].

3.1.2. Perceived Severity

Perceived severity is defined as "one's belief of how serious a condition and its sequelae are (e.g. specify consequences of the risk and the conditions)" [[20], p. 49]. Two aspects of perceived severity were included in this study: harmful in-

fluence on pregnant women and harmful influence on the fetus [2] [35] [38] [40] [43].

3.1.3. Perceived Benefits

Perceived benefits are defined as "one's belief in the efficacy of the advised action to reduce risk or seriousness of the impact (e.g. define action to take: how, where, when, and clarify the positive effects to be expected)" [[20], p. 49]. Quitting of paternal smoking can result in five benefits: 1) saving the fetus and pregnant woman's health from the harmful influence of SHS; 3) reducing the incidence rate of chronic diseases such as heart disease and diabetes for the fetus; 3) reducing the incidence rate of diseases such as respiratory disease and cardiovascular disease; 4) saving your money; and 5) preventing conflagration [29] [31] [32].

3.1.4. Perceived Barriers

Perceived barriers are defined as "one's belief about the tangible and psychological costs of the advised action (e.g. identify and reduce perceived barriers through reassurance, correction of misinformation, incentives, assistance)" [20] [p. 49]. There were five barriers: 1) tobacco smoke that adheres to the wall or furniture continues to emit toxic substances; 2) when you smoke on the lower floor, tobacco smoke characteristically moves to the upper floor; 3) cigarette butts and live cigarettes leave increased side-stream smoke; 4) conflict between smoker and non-smoker in a home; 5) smoking visitor in home [18] [29] [30] [36] [42] [44].

3.1.5. Cues to Action

Cues to action are defined as "strategies to activate one's readiness (e.g. provide how-to information, promote awareness, employ reminder systems)" [[20], p. 49]. There were recommendations for preventing SHS exposure at home: 1) perceived barriers, 2) use educational materials; 3) inform smoking husbands that pregnant women want to end SHS; 4) make a non-smoking day at home; 5) set up reminders for the reasons why pregnant women want SHS exposure to stop; 6) stick a poster for no smoking at home in a conspicuous place; 7) recommend husbands to quit tobacco smoking; 8) urge husbands to smoke outside the home [31] [35].

3.2. Assessment of the Suitability of Educational Comic Booklet Draft

The characteristics of the 17 Indonesian participants are shown in **Table 3**. Of the 14 participants who were in environments with secondhand smoke, five were pregnant women. SAM scores are displayed in **Figure 1**. Participants' descriptive statistics, feedback, and recommendations for each item are reported in **Table 4**.

4. Discussion

This study produced a provisional ECB in Indonesian, which reflected the five

Table 3. Characteristics of the study participants (n = 17).

Characteristics	No.[a] (%) or Mean SD[b]
Age (years)	30 ± 4.6
Gender	
Male	4 /17 (23.5%)
Female	13/17 (76.5%)
(pregnant women)	6/13 (46.2%)
Ethnicity	
Javanese	6/17 (35.3%)
Javanese-Chinese	2/17 (11.8%)
Minangkabau	2/17 (11.8%)
Sasak	2/17 (11.8%)
Sumatra	2/17 (11.8%)
Palembang	1/17 (5.9%)
Betawi	1/17 (5.9%)
Chinese	1/17 (5.9%)
Religion	
Islam	15/17 (88.2%)
Catholic	1/17 (5.9%)
Protestant	1/17 (5.9%)
Completed level of education	
University	15/17 (88.2%)
Junior high school	1/17 (5.9%)
Elementary school	1/17 (5.9%)
Smoking status	
Never smoked	16/17 (94.1%)
Quit after pregnancy	1/17 (5.9%)
Secondhand smoker	14/17 (82.4%)
Pregnant women in secondhand smoker	5/14 (35.7%)
Place of secondhand smoke exposure	
Public transportation	9/17 (52.9%)
Restaurant	8/17 (47.1%)
Workplace	4/17 (23.5%)
Other public location	3/17 (17.6%)
My home	2/17 (11.8%)
Friend/Family & relative's house	2/17 (11.8%)
Smoker in participant's home	
Friends	2/17 (11.8%)

Continued

Brother	2/17 (11.8%)
Father	1/17 (5.9%)
Uncle	1/17 (5.9%)
Smoke-free home	
Yes	14/17 (82.4%)
No	3/17 (17.6%)

[a]No. = number, [b]SD = standard deviation.

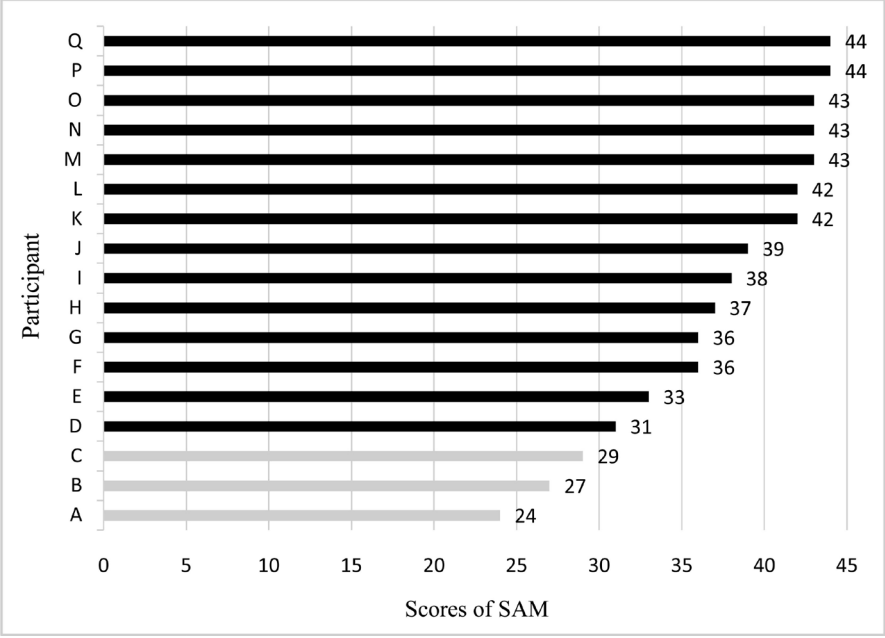

Figure 1. Participant scores: suitability assessment of materials ($n = 17$).

components of the HBM and utilized strategies of cultural appropriateness. Content was the highest-ranking domain and included items rated with high positive feedback. The comments were in line with the results from Doak *et al.* [25]: "Providing clear and limited purpose, scope, and content leads the reader to have a keen interest in the educational material, may understand main point easily" (p. 52).

The lowest scoring domain was literacy demand because the mean of reading grade level was 1.29, which was the lowest scoring item. Whereas most adults in Indonesia are literate [45], about half are considered functionally illiterate, which means that they can read and write in simple terms but cannot answer questions about what they learned. This is important to consider because health risk information is often found in academic journals and usually report risks numerically, which is difficult for functionally illiterate people to understand. Therefore, educators must translate the health risk information into verbal description for the general population.

However, verbal descriptors may not be sufficient. Shaw and Dear [46] found

Table 4. Descriptive statistics of the suitability assessment of materials and comments from the study participants.

Descriptive statistics of the SAM[a]			Comments from participants	
Domains	**Items**	**Mean of items score[b] ± SD[c]**	**Positive feedback (number of comments)**	**Recommendations (number of comments)**
Content		1.79 ± 0.4	**Content**	**Content**
	Purpose	1.94 ± 0.2	The purpose was clearly shown in the title and introduction (2) The scope was limited and suitable to purpose (2) The content topics and solutions of preventing SHS were mentioned (3)	There were no comments provided
	Scope	1.82 ± 0.4		
	Content topics	1.76 ± 0.2		
	Summary and review	1.65 ± 0.6		
Cultural appropriateness		1.74 ± 0.4	**Cultural appropriateness**	**Cultural appropriateness**
	Cultural Image	1.76 ± 0.4	It's really good to show Indonesian smoking behavior (3)	Change some misinterpreted illustrations (e.g. ventilation and fan, measuring the abdominal circumference at antenatal care) (3)
	Cultural Match	1.71 ± 0.5		
Graphic illustrations, lists, tables, charts		1.70 ± 0.5	**Graphic illustrations, lists, tables, charts**	**Graphic illustrations, lists, tables, charts**
	Type of illustrations	1.82 ± 0.4	It's really good to show Indonesian smoking behavior (3) It's really easy to see the meaning of graphics (1) The cover graphics are good (1)	There were no comments provided
	Captions are used to explain graphics	1.76 ± 0.4		
	Relevance of illustrations	1.71 ± 0.6		
	Graphics	1.65 ± 0.5		
	Cover graphic	1.59 ± 0.6		
Layout and typography		1.65 ± 0.6	**Layout and typography**	**Layout and typography**
	Typography	1.76 ± 0.5	There were no comments provided.	Change reading order from right-to-left to left-to-right (12)
	Subheadings	1.65 ± 0.5		
	Layout	1.53 ± 0.6		
Learning stimulation and motivation		1.65 ± 0.6	**Learning stimulation and motivation**	**Learning stimulation and motivation**
	Interaction included in text/Graphics	1.71 ± 0.6	It shows how doable something is (1)	There were no comments provided
	Showing desired behavior patterns	1.71 ± 0.6		
	Motivation	1.65 ± 1		
Literacy demand		1.59 ± 0.6	**Literacy demand**	**Literacy demand**
	Road signs	1.71 ± 0.6	The explanations showed what is next (1) Understandable and active voice used (1) Vocabularies were easy and explicit (3)	Change long sentences to short ones (3) Use common and easy words (13) Use common and easy words (13)
	Writing style	1.70 ± 0.6		
	Vocabulary	1.65 ± 0.6		
	Sentence construction	1.59 ± 0.7		
	Reading grade level	1.29 ± 0.7		
Total average score of SAM:		37.12 ± 6.2		

[a]SAM = Suitability Assessment of Materials, [b]Item scoring: 0 = not suitable, 1 = adequate, 2 = superior. [cg]SD = Standard Deviation.

that there were divergences in perceptions of probability expressions between physicians and laypeople because the verbal descriptors were understood differently [47]. Researchers [48] have also found that statistical evidence was more persuasive than narrative evidence because the statistical evidence comes from a large sample size. Malenka, Baron, Johansen, Wahrenberger, and Ross [49] conducted a study on relative and absolute numbers and found that most laypeople choose a medication because of a relative number rather than an absolute number. Therefore, based on the extant evidence, when we explain the harmful influences of SHS for pregnant women and fetuses using statistical evidence in the educational comic, we should use relative numbers (e.g. the incidence rate of being small for gestation age: 77%).

Recently, reputable organizations such as the World Health Organization (WHO) have begun using numerics, graphs, and visuals in health messages. Health messages using visual aids can be helpful for individuals with low literacy and numeracy skills [50]. WHO provides many types of infographics about public health and environmental and social determinants of health to ensure KT globally [51]. There are several formats for easily showing the numbers, such as circle graph, bar chart, and human pictogram. There is a method for translating these numbers to improve risk understanding, such as susceptibility and severity.

4.1. Feasibility and Cultural Considerations in the Educational Comic Booklet

Three participants recommended changing some illustrations that could possibly be misinterpreted in the comic booklet. For example, a drawing in a panel showed the measurement of the infant's abdominal circumference at the antenatal clinic to explain a health service in pregnancy. However, one participant informed us that Indonesian midwives usually do not measure the abdominal circumference. They recommended substitution with another usual service. Kreuter *et al.* [19] noted that certain images that reflect cultural appropriateness would appeal to the educational targets. To enhance interest in the comic, we decided to change the previous drawing to reflect the usual services offered during pregnancy in Indonesia.

Twelve out of 17 participants requested that we change the reading order from the Japanese style (right-to-left) to Indonesian style (left-to-right). In a sentence, the logical flow of content is made by using transitional phrases or conjunctions to connect two lines or two paragraphs together. In a comic, the logical flow is made by using several small panels, including illustrations and text as segments that are arranged based on the reading order. Laubrock, Hohenstein, and Kümmerer [52] suggested that when reading a comic, the viewer's attention must be coordinated among the central idea or the gist of the picture (gist processing) and the peripheral details (peripheral review) along with the narrative. Cohn [53] noted that people understand sequential images in comics with the combination of the continuity and active constraints. The continuity constraint means using the same characters and elements. The active constraint is about showing differences

of content in visuals [53]. If that were the case, then reversing the order would lead to misunderstanding. Even if readers found true meaning in the comic with a reverse order, they would have to struggle to understand the gist processing and peripheral preview. The reading order should match the reader's logic, language, and experience. It should also promote understanding, acceptance, and behavioral change regarding health care instructions [25]. We decided that it was necessary to change the reading order to promote better understanding for the readers.

4.2. Conclusion

The developed material is the first ECB that follows HBM and strategies for enhancing cultural appropriateness in Indonesia. The participants' characteristics posed a limitation because the majority was women, but the ECB target would be both men and women. In addition, most of the participants had a university education, unlike the target group. Therefore, we surmised that there were some unintelligible visuals (e.g. misunderstanding an illustration, ventilation for eliminating cigarette smoke, such as a fan) and words: simpler language or vernacular language is necessary for local Indonesians in Tomohon. The next steps are as follows: 1) revise the reading order, 2) change measuring abdominal circumference to a panel about taking blood pressure, 3) use more understandable words, and 4) use a subset of the target group to review the comic. After these modifications, we plan to use this ECB as part of an intervention tool in a randomized controlled trial in Indonesia.

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Conflicts of Interest

No conflict of interest has been declared by the authors.

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