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Development of Visual Stories Infographics on Dietary and Physical Activity Management for Hypertension

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ABSTRACT

Background: Hypertension is a non-communicable disease that requires lifestyle intervention. Patients need to be educated on dietary and physical activity management for hypertension. Visual stories and infographics are one of the educational tools that can be effective for this purpose. **Objective:** This study aimed to develop and evaluate visual story infographics based on their level of understandability, actionability, and suitability. **Methods:** This study employed a cross-sectional study design that came in three phases: (I) content analysis, (II) design and development, and (III) evaluation. Ten healthcare professionals in the fields of medicine and dietetics evaluated the visual story infographics on their understandability, actionability, and suitability using the Patient Education Materials Assessment Tool for printable material (PEMAT-P) and Suitability Assessment of Materials (SAM). **Results:** The visual story infographics consisted of 25 pages covering dietary and physical activity management to control hypertension. Clinical guidelines for hypertension were used to develop the content of the infographics. The infographics were designed and developed using the Canva application. Bahasa Malaysia was used for the infographics as it is the national language. The infographics received a 98.8% understandability score and a 100% actionability score. Meanwhile, the overall score for the suitability rating was 86.6%. **Conclusion:** Overall, the newly developed infographic material ranked highly for understandability, actionability, and suitability. This finding indicated that the visual stories and infographics were well received by the healthcare professionals who were responsible for the management of patients with hypertension.

Keywords: Dietary; Hypertension; Infographics; Physical Activity; Selfcare

INTRODUCTION

Hypertension is among the most prevalent non-communicable diseases in Malaysia, and it was reported that 3 out of 10 people in Malaysia have hypertension (IPH, 2019). The management of hypertension requires consistent lifestyle modifications and medications to avoid severe health complications such as kidney failure or premature death (Kario *et al.*, 2022). In addition, during the COVID-19 pandemic, hypertensive patients have higher chances of being infected with COVID-19 (Javed, Javed & Khalid, 2022). However, despite the widespread availability of healthcare programs and facilities, blood pressure control rates remain low, especially among Malay patients (IPH, 2019). The control of hypertension requires patients to understand modifiable and non-modifiable risk factors such as dietary intake, physical activity, age, or genetics (Unger *et al.*, 2020). Understanding the diseases helps create awareness and motivates patients to control their diseases (Tan, 2020). Health education program about functional activity like constipation related to diabetes were useful in improving the outcome by using effective teaching media like videos, role-play, and demonstration (Ragab *et al.*, 2021). A study recommends sufficient daily physical activity to reduce the resistant hypertension probability among treated hypertension patients (Zhang *et al.*, 2023). Therefore, patient education, such as nutrition and physical activity, is necessary to promote understanding and improve hypertension among patients. Moreover, health education could improve patients' knowledge, attitude, and practice towards the management of hypertension (Ab Hamid *et al*., 2022). Another study shows that a correlation exists between knowledge and the practice of self-care in hypertension (Amir & Sansuwito, 2022).

Improving health literacy is necessary to improve the management of hypertension. Patient education should

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be made available to all patients regardless of their socioeconomic status, especially in low- and middle-income countries (Al-Rousan *et al.*, 2020). Patient education materials are offered in various formats, including info sheets, pamphlets, brochures, and videos (Ab Hamid *et al.*, 2021; Gumelar & Tangpukdee, 2022). Health information in the form of visuals or infographics is gaining popularity as a way to quickly transmit medical knowledge (Rotolo *et al.*, 2022). It is also suitable for online and offline health education materials. Besides, Hernandez-Sanchez *et al.* (2021) supported the idea that infographics have become a potent tool and a popular format for sharing medical information globally. Infographics integrate text, data, charts, and graphs to visualize complex information. Furthermore, the use of infographics helps to enhance understanding and promote behavioral changes among people with low health literacy and numeracy skills by enabling them to understand complex medical information (Park & Tang, 2019). The development of infographics is more than simply photos and text (Hernandez-Sanchez *et al.*, 2021). Specifically, visual stories and infographics have narrative immersion that allows people to interact fully with the story's information. A clear beginning and end ensure the reader gets the material in the order intended by the author, helping them understand the key messages (Botsis *et al.*, 2020). Despite numerous studies on the use and development of infographics for patient education (Arcia *et al.,* 2019; Park & Tang, 2019; Stonbraker *et al.*, 2019), there is little evidence on the use and development of infographics on dietary and physical activity management, particularly infographics that incorporate visual storytelling. Therefore, this paper aims to explain the development and evaluation of visual stories and infographics on dietary and physical activity management for hypertension. Visual storytelling infographics focused on hypertension management will provide valuable insights into how visual narrative infographics might improve patient education about hypertension.

METHODOLOGY

Research Design

This study involves a systematic approach to designing, developing, and evaluating the infographics, referred to as developmental research (Richey & Klein, 2005), which consisted of three phases: (I) content analysis, (II) design and development, and (III) evaluation of the infographics.

Phase I: Content Analysis

The information necessary for the learning content that was included in the infographic was taken from a review of the relevant literature. The infographics used sources that were readily available, such as evidence-based publications and guidelines documents, which included Clinical Practice Guidelines on the Management of Hypertension 5th Edition, Malaysia Physical Activity Guideline, Guideline for Healthcare Professionals on Health Education and Communication Tools to Reduce Salt Intake in Malaysia, Malaysian Dietary Guidelines 2020, 2017 Guideline for the Prevention, Detection, Evaluation, and Management of High Blood Pressure in Adults from the American Heart Association, Guidelines on Healthier Choice and My Choice Logo Malaysia, National Health and Morbidity Survey 2019, 2020 International Society of Hypertension Global Hypertension Practice Guidelines The dietary and physical activity recommendations were extracted to be used in the content development of the infographics. Then, the topics for the infographics were decided based on the consensus of the two experts with clinical experience in the management of hypertension.

Phase II: Design and Development

Before developing the infographic material, a storyboard outlining the topics to be covered and the learning goals to accomplish was drafted during the design and development phases. The material for the learning content was prepared in an organized and structured manner. The incorporation of visual storytelling into the process of creating infographics led to the conception of the idea of a storyline, which was also part of the process of creating the infographic itself. Canva was the software used to design and produce infographics for visual stories. Premium users of Canva have access to layouts that include stock photographs and elements that can be used without infringing intellectual property rights. Visual elements obtained from other applications besides Canva, such as Freepik, were downloaded together with their license certificates for use without providing any attribution.

Phase III: Evaluation

In this phase, experts were selected using purposive sampling. The expert evaluation panels consisted of ten

people, in accordance with the recommendations of six to ten experts (Yusoff, 2019). The specialists in charge of the evaluation were selected on the basis of specific criteria, which included having a background in the medical and dietetics fields and being involved in the management of hypertension, having a minimum of five years of experience working as health professionals in the relevant field, and being fluent in both English and Malay (Ab Hamid *et al.*, 2021). On the other hand, experts with no experience in teaching, organization, or evaluation in the medical and dietetics fields were excluded. In this study, experts who participated in the evaluation phase were doctors, dietitians, and nurses. The infographic was emailed to the expert review panels and the survey evaluation tools, Patient Education Material Assessment Tool-Printable (PEMAT-P) and Suitability Assessment of Materials (SAM).

PEMAT-P consisted of 19 questions for understandability that were scored on content, word choice and style, use of numbers, organization, layout and design, and visual aids, and 7 questions for actionability. The ability to comprehend educational resources and extract crucial messages is characterized as 'understandability,' while 'actionability' is defined as the ability to discern what can be done based on educational material information (Shoemaker, Wolf & Brach, 2014). The PEMAT-P gives a score of 1 (agree), 0 (disagree), or N/A (not applicable to the material). The total score for understandability and actionability was calculated in percentages. A more understandable and actionable infographic revealed how easy it is to grasp and motivate people to take action. The Suitability Assessment of Material (SAM) comprised 22 questions for assessing suitability that were evaluated based on content, literacy demand, graphics, layout, and type, learning stimulation and motivation, and cultural appropriateness. This tool allowed us to quickly analyze the acceptability of health information resources for a specific audience (Doak, Doak & Root,1996). This tool rates items as superior (2 points), adequate (1), or N/A (not suitable) (0). Total suitability scores were also calculated as percentages. A higher suitability value means the infographics are suited for hypertensive patients. The panelists were given two weeks to evaluate the infographics and provide input on the assessment tools.

Statistical Analysis

Descriptive statistics were used to analyse the data collected in this study. First, PEMAT-P and SAM scores were computed by adding the total points, dividing by the total available points, and then multiplying the result by 100 to get the percentage. For PEMAT-P, a score of 70% and above was considered understandable and actionable, while for the SAM tool, the score was interpreted as superior material (70-100%), adequate material (40-69%), and not suitable material (0-39%). Means and standard deviations were then generated to measure understandability, actionability, and suitability.

Ethical Consideration

This work was sanctioned by the Research Ethics Committee of Universiti Teknologi MARA(UiTM), Malaysia on 18th May 2022 with reference number FERC/FSK/MR/2022/0097.

RESULTS

Based on the content analysis in phase 1, the visual stories infographics contain 14 topics. Table 1 shows the topics of the infographics.

Table 1: Topics of the Visual Stories Infographics

Topic	Title
1	Overview about hypertension
2	What is Salt?
3	High salt food
4	Limit salt intake
5	Increase the intake of fruits and vegetables
6	Limit alcohol intake

7	Dining out healthily
8	Reduce salt during cooking
9	Eat tastier food without salt
10	Facts and myths about salt
11	Hidden salt in local foods
12	Practice healthy diet
13	How to be active?
14	Tips to stay active

During the second phase of this study, a visual stories infographic which consisted of 25 pages were successfully developed by using Canva application. The education material was written entirely in Malay language. Two main characters were added to make up the flow of the story in the infographics. Figure 1 shows an example of illustrations in the infographics.

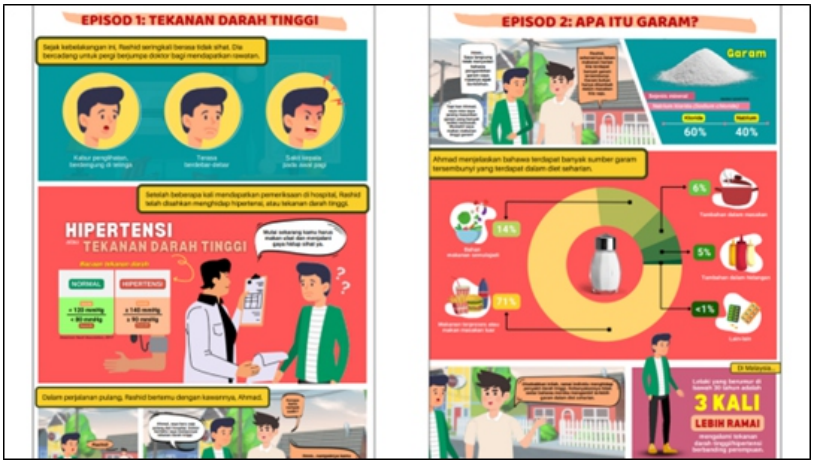

Figure 1: Example of Illustration in Infographics

After completing the development of the visual stories and infographics, the evaluation was performed. Table 2 shows the scoring on understandability, comprised of 17 items rated by ten experts. Every single expert gave a perfect score of 100% on every item that was assessed for its level of understandability, except for two items that were labeled as follows: 'The material does not expect the user to perform calculations', and 'the material provides a summary', respectively, under the topics of 'use of numbers' and organization." One of the ten experts assigned a 0 (disagree) score to both items. The other items under the topic of content, word choice and style, layout and design, and use of visual aids were all rated as 1 (agree). Every expert gave a perfect score of one hundred percent on every item assessed for its level of understandability, except for two items labeled as follows: 'The material does not expect the user to perform calculations', and 'the material provides a summary'. Table 3 shows the actionability scoring, which comprised seven items. All experts rated 1 (agree) for all items in the question, which generated a perfect 100.0% score. Table 3 shows the actionability score for the infographics. All experts rated agreed that the materials are highly actionable (100%).

Table 4 depicts the ratings on suitability by the ten experts, which comprised 22 items. The mean rating for each item ranged from 1.2 to 1.9, with 1.7 being the average mean rating. The item 'Scope is limited' under the content factor received the lowest average rating from the experts, as indicated by a mean score of 1.2. All of the experts gave the highest ratings possible, with a mean score of 1.9, on four different items. These items include 'content is about behaviors, 'summary or review included' under the content factor, 'type of graphics, and 'relevance of illustrations' under the graphics factor. The overall score for the suitability assessment was 86.6%.

Table 2: Descriptive Statistics on Understandability from Patient Education Materials Assessment Tool for Printable Materials (PEMAT-P) (n=10)

Descriptive Statistics on Understandability			
Topic	**Items**	**Means±SD**	**Total Score (%)**
Content			
	The material makes its purpose completely evident.	1.0±0.0	10 (100.0)
	The material does not include information or content that distracts from its purpose.	1.0±0.0	10 (100.0)
Word Choice and Style			
	The material uses common, everyday language.	1.0±0.0	10 (100.0)
	Medical terms are used only to familiarise audience with the terms. When used, medical terms are defined.	1.0±0.0	10 (100.0)
	The material uses the active voice.	1.0±0.0	10 (100.0)
Use of Numbers			
	Numbers appearing in the material are clear and easy to understand.	1.0±0.0	10 (100.0)
	The material does not expect the user to perform calculations.	0.9±0.3	9 (90.0)
Organisation			
	The material breaks or "chunks" information into short section.	1.0±0.0	10 (100.0)
	The material's sections have informative headers.	1.0±0.0	10 (100.0)
	The material presents information in a logical sequence.	1.0±0.0	10 (100.0)
	The material provides a summary.	0.9±0.3	9 (90.0)
Layout and Design			
	The material uses visual cues.	1.0±0.0	10 (100.0)
Use of Visual Aids			
	The material uses visual aids whenever they could make content more easily understood.	1.0±0.0	10 (100.0)
	The material's visual aids reinforce rather than distract from the content.	1.0±0.0	10 (100.0)
	The material's visual aids have clear titles or captions.	1.0±0.0	10 (100.0)
	The material uses illustrations and photographs that are clear and uncluttered.	1.0±0.0	10 (100.0)
	The material uses simple tables with short and clear row and column headings.	1.0±0.0	10 (100.0)
Total understandability score			**168 (98.8)**

Item scoring: 0 = disagree, 1 = agree. SD = Standard deviation.

Table 3: Descriptive Statistics on Actionability from Patient Education Materials Assessment Tool for Printable Materials (PEMAT-P)

Descriptive Statistics on Actionability			
Topic	**Items**	**Mean±SD**	**Total score** (%)
	The material clearly identifies at least one action the user can take.	1.0±0.0	10 (100.0)
	The material addresses the user directly when describing actions.	1.0±0.0	10 (100.0)
	The material breaks down any action into manageable, explicit steps.	1.0±0.0	10 (100.0)

Descriptive statistics of suitability

	The material provides a tangible tool (e.g., menu planners, checklists) whenever it could help the user take action.	1.0±0.0	10 (100.0)
	The material provides simple instructions or examples of how to perform calculations.	1.0±0.0	10 (100.0)
	The material explains how to use the charts, graphs, tables, or diagrams to take actions.	1.0±0.0	10 (100.0)
	The material uses visual aids whenever they could make it easier to act on the instructions.	1.0±0.0	10 (100.0)
Total actionability score			**70 (100.0)**

Item scoring: 0 = disagree, 1 = agree. SD = Standard deviation

Table 4: Descriptive Statistics on Suitability Assessment of Materials (SAM) (n=10)

Descriptive Statistics on Suitability			
Domains	**Items**	**Means±SD**	**Total Score (%)**
Content			
	Purpose is evident	1.8±0.4	18 (90.0)
	Content is about behaviours	1.9±0.3	19 (95.0)
	Scope is limited	1.2±0.6	12 (60.0)
	Summary or review included	1.9±0.3	19 (95.0)
Literacy Demand			
	Reading grade level	1.8±0.4	18 (90.0)
	Writing style – active voice is used	1.8±0.4	18 (90.0)
	Vocabulary uses common words	1.8±0.4	18 (90.0)
	Context is given first	1.8±0.4	18 (90.0)
	Learning aids via road signs	1.5±0.7	15 (75.0)
Graphics			
	Cover graphics show purpose	1.7±0.7	17 (85.0)
	Type of graphics	1.9±0.3	19 (95.0)
	Relevance of illustrations	1.9±0.3	19 (95.0)
	List, tables, etc. explained	1.8±0.4	18 (90.0)
	Captions used for graphics	1.7±0.5	17 (85.0)
Layout and Typography			
	Layout factors	1.7±0.5	17 (85.0)
	Typography	1.4±0.7	14 (70.0)
	Subheads are used	1.6±0.5	16 (80.0)
Learning Stimulation/Motivation			
	Interaction is used	1.8±0.4	18 (90.0)
	Behaviours are modelled and specific	1.8±0.4	18 (90.0)
	Motivation – self-efficacy	1.8±0.4	18 (90.0)
Cultural Appropriateness			
	Match in logic, language, experience	1.8±0.4	18 (90.0)
	Cultural image and example	1.7±0.5	17 (85.0)
Total suitability score			**381(86.6)**

Item scoring: 0 = not suitable, 1 = adequate, 2 = superior. SD = Standard deviation

DISCUSSION

The understandability and actionability of the visual story infographic were assessed using the Patient Education Material Assessment Tool (PEMAT-P). The infographic received a total score of 98.8% for its understandability and a score of 100 percent for its actionability. A high score for understandability indicated that the infographics were simple to comprehend and presented straightforwardly. Only two of the six elements tested for understandability received a mean score of 0.9, which were the 'use of numbers' and organization factors. For the criterion known as 'use of numbers', one of the ten experts did not agree that the infographic did not demand the readers undertake calculations. The same is true for the organization factor, where only one expert did not agree that the infographic gave a summary of the information. On the other hand, all of the experts gave it a score of one (agree) for the other factors, which contributed to it obtaining the ratings in the category of being very easily understandable. Due to the fact that the infographic utilizedtion of visual stories, the layout and design were created in the form of a comic-like style. This was done to ensure that the story was efficiently conveyed to the audience while making the content more fascinating.

Aside from that, this infographic used appropriate word choices for the local language. There was a reduction in the number of times medical phrases were used, and the infographic also used relevant and interactive visual aids. Meanwhile, the high actionability scores of the infographic concluded that the content could clearly describe actions that should be taken and be immediately addressed to users. This is because the infographics in this study were broken up into several smaller sections that each focused on a specific aspect of controlling blood pressure. Encouraging individuals with high blood pressure to engage in moderate-intensity physical activities during their leisure time can help reduce their blood pressure levels (Islam *et al.*, 2023). This was done to make it easier for viewers to determine which course of action would be most applicable to them. Our findings are consistent with another study by Jamil *et al.* (2021), in which the newly developed module scored high median scores for understandability and actionability. The possible reason for the higher score is the incorporation of visual narrative into the infographics for this study. According to Botsis *et al.* (2020), creating stories could assist individuals in engaging with and comprehending health information. In addition, the integration of visual aids and narratives depicted in the infographic used in this research will persuade patients to either take action or change their behaviors that are relevant to their health (Hernandez-Sanchez *et al.*, 2020).

Regarding suitability evaluation, graphic and learning stimulation and motivation scored the highest. This could be due to the infographics making use of relevant visual graphics rather than adding any additional visual elements unrelated to the topic at hand, which could make the infographic appear dull and unpleasant to viewers (Joshi & Gupta, 2021). Another study showed that awareness programme improved the healthcare practices and knowledge of rural people regarding complications of hypertension which could reduce morbidity rate further. Such programmes has implications in the field of nursing education, practice, administration and research (Sarkar, 2020). The finding of this data suggested that awareness programme improved the healthcare practices & knowledge of rural people regarding complications of hypertension which could reduce morbidity rate further. The study has implications in the field of nursing education, practice, administration and research.In addition, the infographic in the present study had graphic characters to match the concept of visual stories. The characters used in the infographics were consistent throughout the information delivery process. This consistency helps the infographics present the content and engage the readers. There were two human graphic characters in the infographics: Rashid and Ahmad. The character of Rashid, who suffered from high blood pressure, was put in place to help viewers, particularly hypertension patients, relate Rashid's situation to their own. In addition, the second main character, Ahmad, is more knowledgeable about hypertension. This helped deliver information throughout the infographics by explaining to Rashid the dos and don'ts of controlling his blood pressure. Aside from that, experts also provided a good rating on learning stimulation and motivation, where the items focused on the usage of interaction, specific and modeled behavior, and motivation for self-efficacy in the infographic. This visual story infographic that was merged with a central storyline while giving health information will facilitate encouraging the readers or patients to take action or change their behavior related to their health (Joshi & Gupta, 2021).

In contrast, the factor with the lowest score was layout and typography. The average score for the 'typography' component under the layout and typography factor was 1.4. Concerning the typography section, one expert expressed the opinion that because the structure of the infographic was designed to resemble a comic book, it would be preferable to use the typeface typically used in comics for the dialogue bubbles, such as Comic Sans. A readable and legible typeface will ensure that the material is understood. In its most basic sense, readability refers

to the ease with which text may be read, which, in turn, makes reading more pleasurable, less fraught with difficulty, and more fascinating. The majority of experts gave a low rating to the component labeled 'limited scope', which earned a mean value of 1.2, indicating that it was the item with the lowest agreement among the experts. A slightly low ranking for this item suggested that experts did not fully cover the overall management of hypertension. In the infographics, the content only had two main components, as mentioned in the objectives, which were dietary and physical activity components. Still, the low ranking on the item may suggest that there could have been a better implementation of the scope to ensure that only relevant information is disclosed.

The present study was also the first to integrate dietary and physical activity aspects of the management of hypertension in visual stories and infographics. The infographic's content is based on scientific evidence and supported by established national and international recommendations for the treatment of hypertension. Although the opinions of healthcare professionals were taken into account in this study, the generated infographics have not yet been subjected to the scrutiny of people with hypertension, which may be a potential limitation. As this study's scope is limited to a single round of evaluation by professionals, the researchers suggest that hypertensive patients evaluate the final, modified version of the visual stories infographic.

CONCLUSION

In conclusion, the infographic created for this study can be regarded as highly understandable, actionable, and suitable for individuals with hypertension. The information in the infographic depicting visual storytelling can significantly contribute to the dissemination of health-oriented dietary and behavioral modifications, which, in turn, may result in enhanced hypertension management or prevention. In addition, the concept of visual stories and infographics can be applied to other disciplines, such as diabetes or cardiovascular patient education.

Conflict of Interest

The authors declare that they have no competing interests.

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