

Visual Design in Healthcare for Low-Literate Users – A Case Study of Healthcare Leaflets for New Immigrants in Taiwan

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Abstract. Healthcare material is an effective communication platform to offer an innovative professional care system which provides a more accurate, accessible and applicable educational platform for patients in a diversified society. However, immigrant populations are vulnerable to serious health disparities, and language barriers may further exacerbate their limited health literacy in accessing health information. Recent studies indicate that visual design might serve as a powerful mean for the delivery of health information because vivid information combined with visual elements seems to affect both affective and cognitive processes to maximize comprehension. Yet, ways to identify the visual factors of healthcare material that best affect low-literate users to learn is a question that remains unanswered. The purpose of this study is to identify the visual factors of healthcare leaflet that affect low-literate users' satisfaction, thus establishing guidelines for designing visual healthcare materials for low-literate users. The study was implemented in three stages, the first of which reviewed existing literature to survey current strategies to evaluate visual design in healthcare for low-literate users. Secondly, 36 appropriate leaflets from existing health educational materials in Taiwan were collected and analyzed. Thirdly, semi-structured interviews were conducted with 10 Vietnamese participants who were new immigrants with a low level of education in Taiwan. The results showed that the factors of healthcare material that affect low-literate users' satisfaction range from creative ideas, design layout of cover, design layout of index, typeface design, color design, pictorial illustrations to realistic photos and cultural factors. A checking list for designing visual healthcare materials for low-literate users was also listed. Successful health communication depends on the health information properly coded by the providers and correctly decoded by the consumers. The findings of this study are expected to be valuable, not only for the providers and consumers of health information, but also for the designers of healthcare material.

Keywords: Visual Design, Health literacy, Healthcare Material.

1 Introduction

At present, rapidly shifting immigration trends pose a real challenge for health care. Kreps & Sparks (2008) indicate that immigrants often have significant language and health literacy difficulties, which are further exacerbated by cultural barriers and economic challenges to accessing and making sense of the relevant health information. Recent research suggests that good health educational materials can help to reduce the literacy barrier and enhance health outcome, because they can help modify attitudes, shape positive behaviours, and improve patients' self-prevention (Andersen et al., 2008; Atkinson, 2009). However, the majority of health educational materials are constructed for well-educated users rather than those with low literacy skills, numbers of new immigrants are forced to seek health information in a non-native language and navigate significant culture barriers.

Recent studies indicate that visual design might service as a powerful mean for the delivery of health information because vivid information combined with visual elements seems to affect both affective and cognitive processes to maximize comprehension. For example, Rajwan & Kim (2010) indicate that the use of visual attributes, images, information graphics, diagrams, and animations to convey and absorb information can provide techniques and tools to help patients gain situational awareness of medical information. Simplifying large data sets and accelerating communication may aid users' decisions more quickly. Furthermore, Choi & Bakken (2010) point out that using concrete and realistic pictures and pictographs with clear captions will maximise the benefit of visuals. Future designs of low-literacy interfaces should include a careful selection of icons and visual images, since these are more realistic than abstracts, and closely resemble the intended meaning of the visuals. At this time, visual appeal plays an important role in bridging the gap between the information provider and the consumer. Yet, ways to identify the visual factors of healthcare material that best affect low-literate users to learn is a question that remains unanswered.

Printed health education resources have been identified as being one of the most influential media for improving the quality of healthcare. Patients can bring them home and reread them to remind themselves of key points if they are too shy to ask in the clinic (Harvey, et al., 2000). However, racks of health information brochures in clinics are still ignored by patients and these account for much of the government's annual budget for health promotion (Kreuter et al., 2010). The purpose of this study is to identify the visual factors of healthcare leaflet that affect low-literate users' satisfaction, thus establishing guidelines for designing visual healthcare materials for low-literate users. Considering the issues of concern above, the primary research objectives of this study are described below:

- To survey current strategies to evaluate visual design in healthcare for low-literate users.
- To identify the visual factors of healthcare material which affect users' satisfaction
- To establish guidelines for designing visual healthcare materials for low-literate users

2 Theoretical Backgrounds

2.1 Developments and Assessment of Healthcare Leaflets

Leaflets are probably the most popular educational materials, because they are relatively inexpensive to create and easy to carry. However, they provide no feedback only one-way communication and are not tailored for specific audience. The factors of leaflets to appeal to users to pick up or cause them to give up reading health information are varied. Frederikson & Bull (1995) investigated whether or not the impact of leaflets really encouraged patients to adopt a more thoughtful and prepared approach toward consulting their doctor. The results showed that there were clear differences between the control and experimental groups in terms of the proportion of consultations being perceived as containing good, average and poor communication. However, the sample size was relatively small and the use of a single doctor seriously limited the generalisability of the findings. Moreover, Steele et al. (2011) developed and evaluated health information leaflets to promote public awareness of the link between lifestyle and cancer. They made use of feedback from the general public, healthcare practitioners and design professionals by means of focus groups, questionnaires and semi-structured interviews to design newly-developed leaflets. Therefore, they conducted usability surveys and awareness tests to compare the attractiveness and effectiveness of the newly-developed leaflets and existing standard leaflets. The result showed that both of the leaflets increased awareness of the link between lifestyle and cancer but participants expected the healthcare leaflets could be more usable as well as legible and comprehensible.

Do healthcare leaflets have a similar impact on low-literate users in terms of promoting the acquisition of knowledge and changing attitudes? Kripalani et al. (2007) conducted a randomised controlled trial to explore the difficulties and needs of low-literate patient in healthcare materials. The results showed that almost all the patients declare that it was difficult to understand prescription drug labels and other medication instructions and considered an illustrated medication schedule might be a useful and easily understood tool to assist with medication management. Moreover, Shaw et al. (2009) recruited 321 patients at an in-patient cardiology unit to examine the readability of healthcare leaflet. The findings showed that 22% of the patients interviewed were found to have a low level of literacy. Many of them felt that the health information on the leaflets should be written in plain language. Apparently, there is a broad gap between patients and leaflets, because most of the existing educational leaflets do not consider both internal content and external presentation.

2.2 Visual Appeal in Healthcare

Recent studies indicate that visual appeal might service as a powerful mean for the delivery of health information. For example, Doak et al. (1996) investigated whether a message showed with visuals and graphics is better than a message showed with sound. The results showed that the memory systems in the brain favour visual storage and visual presentations have been shown to be 43 per cent more persuasive than

unaided presentations. Furthermore, Brotherstone et al. (2006) explored the effectiveness of visual illustrations in improving people's understanding of the preventive aim of Flexible Sigmoidoscopy (FS) screening. They recruited 318 older people to attend FS screening and randomly allocated them to receive written information alone, or written information plus illustrations. The findings confirmed that pictorial illustrations resulted in significantly better understanding.

Low-literate users may have different preferences from high-literate users in terms of visualisation, what are the underlying factors of visual design that need to be considered for users with lower literacy? Choi & Bakken (2010) indicate that using concrete and realistic pictures and pictographs with clear captions will maximise the benefit of visuals. Nevertheless, one emerging theme is simplicity in design, content, and technical features. They also suggest that future designs of low-literate interfaces should include a careful selection of icons and visual images, since these were more realistic than abstracts, and closely resemble the intended meaning of the visuals. In addition, Rajwan & Kim (2010) indicate following perspectives to make use of visualisation to support patient-provider health communication, which includes physical and biological aspects of the participants; language, literacy, numeracy, and graphicacy encoding and decoding; shared mental models and common ground; concordance in the understanding by the participants. They also suggest some consideration for supporting patient cognition regarding medical decisions, such as the patient's ability to use visualisation techniques and tools, the patient's ability to perceive, encode and decode information as it is presented, the patient's ability to interpret visualised information in a way that is correct and consistent with care goals, and the patient's ability to make decisions based on interpreted data in an informed fashion.

2.3 Visual Factors of Healthcare Media

What are the visual factors of healthcare media that might affect users' satisfaction? Frascara (2004) indicates that 'graphic design' as a term is more descriptive and appropriate than 'visual communication', because it encompasses various creative aspects related to the following issues: perceptual message, cultural recognition, source collection, publication organisation, aesthetic styles, broadcasting media, technical quality, and written and spoken language. Arntson (2003) also suggests that designers should apply the following principles of visual perception to practice visual communication: information perception, a dynamic balance, good gestalt, usage of text types, layout styles, illustration and photography in design, advertising design, and designing with colour. Ambrose & Harris (2009) stress that graphic design is a multidisciplinary process that draws on many creative sources, including industrialisation, technology, typography, consumerism, identity and branding, social responsibility, modernism and post-modernism, nostalgia and rhetoric, semiotics, and the vernacular. Dabner (2010) points out that the fundamental components of graphic design are positive and negative space, form and space, symmetry & asymmetry, basic principles of layout, style of layout, pace and contrast, size and format, coordination and identity, and photography and illustration. When taking a

comprehensive view of the above scholars' opinions, it would appear that the fundamental components of graphic design within healthcare materials cover diverse disciplines ranging from message presentation to aesthetic styles, technical quality, typography design, layout arrangement, colour contrast, cultural recognition, advertising strategy and photography and illustration.

In terms of creative ideas, although advertising strategies involve a constant search for a new and innovative way to express sales appeal, there are also some creative formats that have worked over the years; for example, creative strategies that involve straightforward demonstration, comparison, scene from everyday life, humour, and celebrity may attract attention, stimulate interest, and foster audiences' positive mood (Altstiel & Grow, 2010; Moriarty et al, 2012; Fill, 2013). In terms of layout design, a good arrangement of graphic elements, such as headlines, sub-headings, pictures, branding, etc. will achieve a smooth flow of information and eye movement for maximum effectiveness or impact. A visual structure of repetition, rhythm, pattern, series, sequence, balance, symmetry, and movement are probably the most common layout arrangements (Frascara, 2004); In terms of typography design, a typeface has aesthetically powerful impacts and is varied in colour, form, and spacing. It is better to use a suitable font size to improve the readability of the content and different styles and forms of typeface to better organise the content better and make it easier to understand (Ambrose & Harris, 2009; Dabner, 2010). In terms of colour scheme, it is crucial for designers to remember that bright colours are excellent for attracting attention; contrast value is the key to legibility. The psychology of colour may evoke emotional feeling, and the symbolic meanings of colours provoke an immediate association with synesthesia. (Dabner, 2010; Sherin, 2012); In terms of illustrations, these are many ways to visually represent an idea, object, person, or place can be used to evoke audiences', but the picture has to be well-composed, with a fashionable concept, designed in a good tonal range, and matching the aims of the title (Dabner, 2010; Sherin, 2012). In terms of the cultural issue, how can the gap of cross-cultural communication be bridged in order to appropriately deliver the desired message to the audience? Liquori (2011) indicates that designers need to consider a wide range of features, such as language, symbol, image, colours, and navigational ways of reading. Since each culture has its own unique way of constructing sentences, sharing icons, matching images, associating colours and navigating reading. All the aforementioned concerns about graphic design will be integrated into further semi-structured interviews to provide a holistic framework.

3 Methodology

In order to identify the visual factors of healthcare media that affect low-literate users' satisfaction, semi-structured interviews were conducted with 10 Vietnamese participants who were new immigrants with a low level of education in Taiwan. Based on the orientation of the data collection, in-depth interviews can be classified in a variety of ways including formal, less formal and informal; structured, semi-structured and unstructured; focused or non-directive; and informant interviews

versus respondent interviews. However, semi-structured interviews are more suitable for obtaining people's opinions; furthermore, they guarantee good coverage and enable the interviewer to probe for answers (Drever, 2003). Successful semi-structured interviews require much more advanced preparation and investigation than fully structured interviews, as well as more discipline and more creativity during the actual interviews, and more time for analysing and interpreting the results (Wengraf, 2001). Therefore, the method of semi-structured interview was chosen for this study. The main questions for the semi-structured interviews were planned in advance to create the overall structure and what was said during interviews was recorded to be analysed and interpreted later.

These interviews were conducted separately to avoid individual participants' statements affecting others' opinions. These interviews were also processed accompanied by a Vietnamese interpreter to reduce their stress and create a safe environment for these low-literate participants. During the face-to-face interviews, some common graphic terms were interpreted to help them to express the factors that affected their satisfaction. All the predicted answers were listed in a questionnaire format to ensure that the responses of the interviewees followed the structure of questionnaire, while all the unpredictable answers were recorded in an open text box. The duration of each interview was an hour and interview data was recorded either by hand-written notes or by audiotaping. The audiotaped data from entire interviews was transcribed and used as data to analyse the evaluation process. After searching the leaflets related to health education in Taiwan, some inappropriate issues were discarded, while some appropriate issues were retained to be applied to this research. 36 pictures from existing health educational materials in Taiwan were collected and divided into 8 categories based on the above-mentioned issues. Each category was presented with four test pictures and several corresponding interview questions, as follows: What do you see in these pictures? What do they mean to you? What emotions do you feel as you look at this? Which are your favourite pictures? Why are them your favourite? Which are your dislike pictures? What are your reasons for disliking?

4 Discussions and Suggestion

The findings from this study that contribute to new knowledge about visual designing in healthcare for low-literate immigrants are described below.

4.1 Creative Ideas

The participants considered some specific factors of creative ideas that help low-literate audiences to learn best, the first of which was the concept of being straightforward; for example, a breastfeeding photo to convey the message of the advantage of breastfeeding or an anti-smoking icon to convey the message of anti-smoking. Most of the participants mentioned that they preferred if when designers informed them of the main theme directly rather than describing a long story in detail,

whereas a few of them mentioned that the idea of straightforward showed superficial creativity in design. Some of the participants pointed out that ridiculous humour may have a negative educational effect, such as using a bespectacled boy in a photo to promote the prevention of myopia. The third creative idea was the celebrity endorsement; for example, a slogan presented by an idol, a politician, or a movie star could enhance the credibility of health promotional media. However, the celebrity should be familiar to the target audience and not show a commercial intention. The fourth creative idea was conveying a cultural message using specific symbols. Most of the participants indicated that they felt being respected by local people by seeing the scenes of Vietnamese culture adopted in educational material, whereas some who had just arrived in Taiwan felt that emphasizing the Vietnamese image was discriminatory. In addition, all the participants pointed out that the idea of shock or metaphor should be avoided because they did not like the use of religion or illness to show the desire for behavioural change neither did they like the use of text under the table or the use of images beyond their understanding.

4.2 Design Layout of Cover

Most of the participants agreed that a layout containing the subjects in high contrast and the background in low contrast highlighted the theme because they did not want to spend too much time distinguishing the subject from the background. The second scheme of design layout of cover was symmetrical arrangement, and some of the participants mentioned that they would like to see a balanced design with a symmetrical arrangement of the subjects rather than a rhythmic design with the subjects spontaneously arranged. The third issue involved plenty of empty white space adopted in the layout, the majority of participants mentioned that they expect a limited content presented on a layout that contains the appropriate amount of white space, but they couldn't stand for a tiny subject shown in a wide white layout; All of the participants declared that a rhythmic composition could stimulate them to stop and read the message on the layout, because an irregular arrangement with small pictures on the layout could cause an unstable composition and further result in visual disorder. In addition, some of the participants claimed that they did not like the use of hi-tech techniques to show the creative idea; for example, an overlapping presentation combined with pictures and text created by Photoshop, because they could not distinguish the text on the upper layer from the image on the lower layer.

4.3 Design Layout of Content

Most of the participants mentioned that they preferred divided sections rather than the complete information because of their low level of patience. The second issue of was scheme with one topic per page. The majority of the participants pointed out that they didn't like the idea of too much information on the same page and several themes presented at the same time. Some of the participants pointed out that the theme was clearer when the subject was placed in the middle. The third issue was the scheme of bullet points. Most of the participants stressed that they preferred numbering rather

than bullet points because it was easier to recognize. The fourth issue was the scheme of one picture per paragraph. Most of the participants said they preferred that every question is accompanied by an interpretive photo, and the illustrations were placed near the relevant text. In addition, some of them declared that they preferred the text were arranged in a row rather than the text was actively placed around a picture because they could not find the beginning and ending of the content. Some of the participants pointed out that the advertising should be clearly distinguishable from the editorial content. They would not pick up any educational material that looked like a general flyer.

4.4 Typeface Design

Most of the participants indicated that for typeface design, they would like to see the title, heading, subheading, and context presented in a variety of styles. However, some of them mentioned it would be better to use no more than two kinds of typefaces for the context, because graphic typography is incomprehensible and abstract. The second issue was the use of a suitable font size. The majority of the participants agreed with the use of a large text size to increase legibility, whereas a few of them suggested that a smaller font size, i.e. 12 points, would leave more space for the text, because they wanted to see sufficient information rather than it being limited. Moreover, some of the participants indicated that they expected a large font size, bright colour, and clear title rather than a small, dull and blurry title because they wanted to determine whether or not the specific theme met their needs at first glance. The third issue was the use of artistic headings and corresponding monochrome text. Some of the participants stressed that a monochrome text with a simple style was easy to read, but it sometimes looked boring, whereas coloured text with an artistic style was difficult for recognising the text but sometimes looked versatile. Therefore, a title with an artistic style accompanied by body text with a simple style would be the best typeface scheme; on the contrary, all the participants declared that they preferred the use of underlined text rather than the use of graphic devices to highlight key messages. Designers should not presume that highlighting is a useful method to help readers to find the key terms in an article.

4.5 Colour Scheme

Some specific factors of colour scheme were considered by the participants, the first of which was using bright colours & familiar ad colours, and most of the participants mentioned that they preferred a highly contrasting design to generate an active feeling and a well-known advertisement colours makes them remember the content at first glance; however, a few of the participants declared that the use of fancy colours could generates a vulgar feeling, whereas others thought that that drawing attention to the advertisement may cause negative effect. The second scheme was the use of monochrome colours. Some of the participants believed that the use of monochrome colours made the content look comfortable and valuable because of a natural associate, whereas others thought that a dull colour scheme made them feel excluded because of a blur associate. The third scheme was using colour for different genders; for example, warm colours are always regarded as being feminine colours, whereas

cold colours are always regarded as being masculine colours. Therefore, pink and orange colours are used to promote women's health, while blue and green colours are used to promote men's health. Most of the participants stressed that they were eager to pick up healthcare materials related to men's health, because their husband were general older and needed home cares. On the contrary, all the participants declared that they disliked the scheme of using ethnic colours to stimulate them to fight for their identity, because they don't not know which colours can represent Vietnam.

4.6 Pictorial Illustrations

The majority of the participants mentioned that they preferred artists to make use of watercolours to sketch the natural world, whereas a few of them thought that the outline of subjects illustrated by watercolours was too vague to be recognised. The second factor of illustration was line drawing. Some of the participants declared that the use of line drawing gives an impression of professionalism and is convincing, whereas others thought that the use of contour line drawing shows that the designer was in a hurry to finish it. The third factor of illustration was photography, and some of the participants indicated that they preferred realistic photos to serve as visual aids to deliver healthcare information written in unfamiliar terms or complex phrases, but they can't accept a stranger's photograph or a photo that tell a miserable story. The fourth factor of illustration was cute cartoons. Some of the participants showed their interest in digital cartoons because of their cute characters, whereas others mentioned that the use of cartoons was not very convincing because they were fake. In addition, some of the participants stressed that they expected an interesting topic to be accompanied by a beautiful drawing rather than a sloppy design accompanied by monotonous pictures because nobody wants to go home with an ill-designed leaflet to prepare the necessary healthcare.

4.7 Realistic Photos

Some specific factors of realistic photos were considered by the participants, the first of which was a scene from everyday life. All the participants agreed that the use of innocent children's faces and warm family scenes make health educational material more welcoming, but they prefer to see familiar faces and scenes in pictures since this makes them feel safe. Besides, most of the participants indicated that they would love to see a scene of three generations to depict endless happiness, but the people should be healthy and beautiful to represent a positive vision. The second factor of realistic photos was using of specialization. Most of the participants preferred the use of a photo of a doctor to represent professionalism, whereas others thought that professional medical photo made them feel that the content of the article was hard to read and even reminded them that they couldn't understand what the doctor says in the clinic. The third factor of realistic photos was using symptoms of a disease, and some of the participants mentioned that the photos of symptoms which could help them to recognise the disease were useful, whereas some of them couldn't accept the use of detailed symptoms of diseases which made them feel uncomfortable. On the contrary, the majority of the participants declared that the application of general medical equipment and supplies should be avoided, because they didn't like unrelated

photos only used for decorative purposes, but with no connection to the subject. They felt cheated if they depended on the photo to decide whether to read the text or not. In addition, some participants pointed out that they didn't want to see indecent photos that embarrassed them, for example, clear photos of breastfeeding, lovers kissing, or naked bodies.

4.8 Cultural Factors

Some specific cultural factors were considered by the participants, the first of which was adopting the factor of a hometown landscape, and the majority of the participants agreed that a familiar scene would remind immigrants of their origin, but the character of hometown landscape must be prominent to represent Vietnam. The second scheme was adopting the factor of hometown festivals. Some of the participants claimed that they would love to see specific props, costumes, dances and festive activities to give the impression of a family reunion, but the activities should be famous nationwide. The third scheme was adopting the factor of living habits. Some of the participants preferred to show off their delicious home-made meal to represent their uniqueness; whereas others were afraid they would be overlooked if such simple ingredients were used to represent Vietnam. However, most of the participants declare that they couldn't accept a description of a lower standard of living which made them feel being discriminated. On the contrary, the adoption of the religious references was abandoned by the participants because most of them didn't have religious beliefs and didn't like the use of serious religion to represent the relaxed lifestyle in Vietnam.

The woman varied many issues, some of which were contradictory. This shows design is not an exact science and designs need to do bespoke testing. However, despite a low sample number, the rich discussion that occurred allows us to recommend the following guidelines:

Table 1. A checking list for visual low-literate healthcare materials

Creative Idea - Suggest	Creative Idea - Avoid
<ul style="list-style-type: none"> ● Using the concept of straightforward ● Using the concept of humour ● Using the concept of celebrity ● Using the concept of culture 	<ul style="list-style-type: none"> ● Avoid using the idea of intimidation ● Avoid using the idea of metaphor ● Avoid using idea of infamous celebrity ● Avoid using imitation advertising scheme
Layout Design - Suggest	Layout Design - Avoid
<ul style="list-style-type: none"> ● Using plenty of empty white space ● Using symmetrical arrangement ● Using the scheme of bullet points ● Using the scheme of segmentation ● Using the scheme of one topic per page ● Using the scheme of illustration of subtitle commentary 	<ul style="list-style-type: none"> ● Avoid using rhythmic composition ● Avoid using unbalance composition ● Avoiding using tiny subjects shown in a wide white layout ● Avoid using the scheme of full layout

Table 1. (continued)

Typeface Design - Suggest	Typeface Design - Avoid
<ul style="list-style-type: none"> ● Use of an eye-catching title ● Use of suitable font size ● Use of a variety of styles of typeface ● Use of artistic headings and corresponding monochrome text 	<ul style="list-style-type: none"> ● Avoid using of graphic devices to highlight key messages ● Avoid using monochrome text for whole section ● Avoid using same style for title and content
Colour Design - Suggest	Colour Design - Avoid
<ul style="list-style-type: none"> ● Using bright colours ● Using familiar ad colours ● Using colour for different genders ● Using contrasting scheme 	<ul style="list-style-type: none"> ● Avoid using ethnic colours ● Avoid using scheme of low contrasting ● Avoid using scheme of similar colours for subjects and background
Illustration Design - Suggest	Illustration Design - Avoid
<ul style="list-style-type: none"> ● Applied with watercolour ● Applied with line drawing ● Applied with photography ● Applied with the subject of three generations 	<ul style="list-style-type: none"> ● Avoid applying fake cartoon ● Avoid applying negative vision. ● Avoid applying line drawing in draft
Photo Design - Suggest	Photo Design - Avoid
<ul style="list-style-type: none"> ● Using everyday life ● Using photo of a doctor ● Using symptoms of a disease 	<ul style="list-style-type: none"> ● Avoid using intimidating photos ● Avoid using indecent photos ● Avoid using detailed photos of diseases and treatment ● Avoid using photos unrelated to the theme
Cultural Design - Suggest	Cultural Design - Avoid
<ul style="list-style-type: none"> ● Adopting the factor of hometown landscape ● Adopting the factor of hometown festivals ● Adopting the factor of living habits 	<ul style="list-style-type: none"> ● Avoid adopting the factor of religion ● Avoid adopting unfamiliar living style ● Avoid adopting the factor of a lower standard of living

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