

USE OF MESSAGE FRAMING AND COLOR IN VACCINE INFORMATION TO INCREASE WILLINGNESS TO BE VACCINATED

YU-HUNG CHIEN

National Taiwan Normal University, Taipei, Taiwan, ROC

Some young Taiwanese people who did not receive the H1N1 vaccine were infected with the influenza. In this study prospect theory was combined with color psychology in order to explore if 2 factors, framing of the message (gain vs. loss) and color combination (white text on a red background vs. white text on a blue background), influenced the persuasiveness of televised vaccination information and viewers' willingness to be vaccinated. Participants were 120 university students, aged between 19 and 24, who were randomly divided into 4 groups to view televised vaccination information that was presented using different combinations of the factors. Participants then completed questionnaires and a significant interaction was found between message framing and color combination, which affected information persuasiveness and the respondents' willingness to be vaccinated. Loss-framed messages with white text on a red background was the most effective at enhancing vaccination information persuasiveness and people's willingness to be vaccinated.

Keywords: color psychology, prospect theory, vaccine information.

Cases of H1N1 influenza were first reported in April of 2009 and it was declared to be a pandemic within six weeks. By July 2010, approximately 18,500 people had died from the disease (WHO, 2010). In Taiwan, cases continued to be reported in 2010, including a number of cases in a recruit training center in May and the death of a university student in July (Centers for Disease Control, 2010a). In order to prevent H1N1 flu from making a comeback or the virus from mutating, which would lead to another pandemic crisis, the World Health

Yu-Hung Chien, Department of Technology Application and Human Resource Development, National Taiwan Normal University, Taipei, Taiwan, ROC.

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Please address correspondence and reprint requests to: Yu-Hung Chien, Department of Technology Application and Human Resource Development, National Taiwan Normal University, 162, Ho-Ping East Road, Section 1, Taipei, Taiwan 106. Email: roland.chien@ntnu.edu.tw

Organization continues to maintain its disease prevention mandate for H1N1 flu. The way to maintain public health and prevent another pandemic is for every country of the world to effectively and continuously promote H1N1 vaccine information so as to increase the vaccination rate.

The H1N1 vaccine is offered free of charge in Taiwan. Nevertheless, only 25% of Taiwanese people have been vaccinated. The vaccination rate among young people aged between 19 and 24 is as low as 3.6% (Centers for Disease Control, 2010a). Fedson (1994) suggested that efficient promotion is the key to an enhanced vaccination rate. So, what should the Taiwanese government do to increase the vaccination rate? Previous researchers have indicated that manipulating the framing of the message in line with prospect theory (Kahneman & Tversky, 1979) and the emotion of color when designing healthcare-promoting materials could help subconsciously influence individuals' willingness to accept information and their level of knowledge after being exposed to the information (for examples in message framing, see Abhyankar, O'Connor, & Lawton, 2008; Gerend & Shepherd, 2007; Gerend, Shepherd, & Monday, 2008; Gerend & Sias, 2009; McCaul & Johnson, 2002; for examples in the emotion of color, see Elliot, Maier, Moller, Friedman, & Meinhardt, 2007; Elliot & Niesta, 2008; Gerend & Sias, 2009).

Proponents of prospect theory (Kahneman & Tversky, 1979) hold that different ways of making a statement, despite the fact that each of the messages has same logical implications, will lead to different decisions. This is known as the *message framing effect*. A message in which it is emphasized that *taking certain actions will result in benefits* (e.g., smoking cessation improves your health and prolongs your life) is *gain framed*. Conversely, a message in which it is emphasized that *unwillingness to take certain actions will lead to losses* (e.g., smoking kills you slowly and painfully) is *loss framed*. Researchers who have explored message framing in relation to inoculation for the human papillomavirus vaccine, have found that people were more willing to be vaccinated when they saw loss-framed vaccination promotion messages (Gerend & Sias, 2009). Similarly, when researchers explored message framing in relation to the measles, mumps, and rubella (MMR) vaccination, loss-framed messages were found to be effective (Abhyankar et al., 2008). However, when McCaul and Johnson (2002) explored the relationship between the willingness of the elderly to get a flu shot and message framing, it was found that message framing did not appreciably change vaccination rates. As a result, further studies are required because it remains unclear whether or not differently framed messages affect the success of the promotion of vaccination. Furthermore, because university students have the lowest H1N1 flu vaccination rate in Taiwan this group is one that it would be advantageous to study for their reactions to the framing of the message about vaccination.

Another factor that can subconsciously influence respondents' emotions and cognition is color combination. Color often subconsciously affects people's decision-making processes (Elliot et al., 2007; Elliot & Niesta, 2008; Gerend & Sias, 2009). In the design of promotional materials, combinations of color with various types of texts/backgrounds have different influences on drawing attention (Laughery, 2006) and emotional responses (Backer, Rogers, & Sopory, 1992). However, the same color can arouse different emotional responses in different situations. For example, red is often used as a warning in the field of healthcare (Laughery, 2006) and, psychologically, this color can imply negative connotations, such as bleeding, injury, and infection (Gerend & Sias, 2009). However, in daily life red can indicate positive feelings, such as celebration, attraction, and love (Elliot et al., 2007; Elliot & Niesta, 2008). White text on a red background is often used in healthcare information, for example on the Red Cross banner. According to the International Organization for Standardization (2002), white text on a red background can attract a high degree of attention and has high visibility (Laughery, 2006). Blue often represents tranquility, positive feelings, and steady emotions. However, under different circumstances, it can be linked to negative or sad emotions (Elliot et al., 2007; Elliot & Niesta, 2008). White text on a blue background also has a positive and pleasing visual effect (International Organization for Standardization, 2002; Laughery, 2006). Therefore, in this study the implications of presenting vaccine information in white text on a red background and in white text on a blue background in the promotion of vaccination compliance were explored.

The population with the lowest H1N1 flu vaccination rate in Taiwan (Centers for Disease Control, 2010a) was targeted and it was explored how differently framed messages and color combinations on television, as the most popular medium, would increase individuals' willingness to be vaccinated.

METHOD

RESPONDENTS

Respondents were 120 students (64 males and 56 females) from three different Taiwanese colleges and universities, aged between 19 and 24 ($M = 19.65$, $SD = 1.16$). Before the students took part in the study, I confirmed that they were not colorblind and that none of them had been infected with the H1N1 flu virus. Seven of the students had been inoculated with the seasonal flu vaccine during the past year.

DESIGN

Using a 2×2 between-subjects factorial design, the influence of message framing (gain-framed message vs. loss-framed message) and color combination

(white text on red background vs. white text on blue background) on the effectiveness of televised vaccine information as well as willingness to be vaccinated were explored. Colors were established in compliance with the International Organization for Standardization (2002). In terms of dependent variables, the Vaccination Willingness Questionnaire (Gerend et al., 2008; Gerend & Shepherd, 2007; Gerend & Sias, 2009) and the Information Persuasiveness Questionnaire (Gerend & Sias, 2009) were the measures used in this study.

MATERIALS

The televised vaccine information for H1N1 flu was a still advertisement with pictures and text. The text was shown on a screen and was also spoken using text-to-speech technology, developed by the Industrial Technology Research Institute (2010). A total of four different picture-text vaccine messages, including gain-framed white text on a red background, gain-framed white text on a blue background (see Figure 1), loss-framed white text on a red background (see Figure 2), and loss-framed white text on a blue background, were presented. Each of these messages lasted for 67 seconds. The text containing the vaccine information was a modified form of promotional materials that were originally produced by the Centers for Disease Control (2010b).

新型流感H1N1疫苗：

施打疫苗可以保護自己與家人健康

施打疫苗的好處？

- ◎ 施打完疫苗二至四週後使身體免疫力增加，能夠有效避免感染H1N1。
- ◎ 國內施打疫苗完全免費，請主動至醫學單位要求施打疫苗，讓你能夠在目前新型流感H1N1盛行期間，不用擔心意外地感染H1N1。
- ◎ 施打疫苗是公認最佳的利器，可以避免H1N1威脅，不用擔心因為感染H1N1形成意識不清、敗血症、呼吸困難、血液等重症的發生。
- ◎ 僅透過注意公共衛生，勤洗手戴口罩都無法達到完全的保護，唯有透過施打疫苗才能保護自己與保護家人。

施打完疫苗，你在工作或是在公共場所活動便不會感到健康受到威脅，對保持自己身體健康有信心。

保護自己並常保健康！請即刻接受新型流感H1N1疫苗之接種。

Figure 1. A gain-framed message consisting of white text on a blue background. The image depicts two healthcare professionals who are smiling at respondents, and the title reads “The H1N1 vaccine protects the health of you and your family”.

新型流感H1N1疫苗：
拒絕疫苗如同漠視自己與家人健康



不施打疫苗的風險？

- ①若不施打疫苗，無法增加身體免疫力，無法有效避免感染H1N1。
- ②國內施打疫苗完全免費，若不主動至醫學單位要求施打疫苗，在目前新型流感H1N1盛行期間，必須擔心意外地感染H1N1。
- ③若不施打疫苗則喪失公認最佳的利器之保護，無法避免H1N1威脅需擔心因為感染H1N1形成意識不清、敗血症、呼吸困難、血液等重症的發生。
- ④僅透過注意公共衛生、勤洗手戴口罩都無法達到完全的保護，若是又不施打疫苗不僅不能保護自己亦危害家人。

若不施打完疫苗，你在外工作或是在公共場所活動會感到健康受到威脅，對保持自己身體健康缺乏自信。

不要危害自己健康造成感染！請不要拒絕新型流感H1N1疫苗之接種。

Figure 2. A loss-framed message consisting of white text on a red background. The image depicts a middle-aged man who is coughing in pain, and the title reads “Refusing the H1N1 vaccine is ignoring the health of you and your family”.

VACCINE INFORMATION PERSUASIVENESS

In the questionnaires the respondents were asked: “Did the vaccine information attract your attention?”, and “Was the vaccine information reliable?” Respondents answered on a 7-point Likert scale (1 = *very strongly disagree* and 7 = *very strongly agree*). The reliability analysis rendered an overall good reliability ($\alpha = .74 > .70$).

WILLINGNESS TO BE VACCINATED

In the questionnaires respondents were asked how likely it was that they would “consider getting vaccinated” and “get vaccinated right away”. Respondents answered on a 7-point Likert scale (1 = *very strongly disagree* and 7 = *very strongly agree*). The reliability analysis rendered an overall good reliability ($\alpha = .87 > .70$).

All of the vaccine messages were shown on a Sony Bravia 32-inch television screen. The respondents sat on a sofa to randomly view 1 of the 4 different messages, then they completed the survey.

RESULTS

The statistics for the average number of questions answered and their standard deviations are given in Table 1. The analysis of variance (ANOVA) of the questions answered is shown in Table 2.

TABLE 1
AVERAGE NUMBER OF QUESTIONS ANSWERED BY RESPONDENTS AND THE ASSOCIATED STANDARD DEVIATIONS

	Vaccine information persuasiveness		Willingness to be vaccinated	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Message framing				
Gain	3.82	1.53	2.82	1.42
Loss	4.26	1.25	3.10	1.34
Color combination				
White text on a red background	4.17	1.57	3.18	1.48
White text on a blue background	3.90	1.23	2.73	1.26

TABLE 2
ANOVA OF THE ANSWERS

Source	Measure	Type III SS	<i>df</i>	<i>MS</i>	<i>F</i>	<i>p</i>
Message framing	Persuasiveness	5.85	1	5.85	3.17	.78
	Willingness to be vaccinated	2.41	1	2.41	1.32	.25
Color combination	Persuasiveness	2.00	1	2.00	1.08	.30
	Willingness to be vaccinated	6.08	1	6.08	3.32	.07
Message framing × Color combination	Persuasiveness	14.35	1	14.35	7.77	.00
	Willingness to be vaccinated	7.08	1	7.08	3.83	.05
Error	Persuasiveness	214.38	116	1.85		
	Willingness to be vaccinated	212.30	116	1.83		
Total	Persuasiveness	2192.75	120			
	Willingness to be vaccinated	1278.00	120			
Corrected total	Persuasiveness	236.58	119			
	Willingness to be vaccinated	227.79	119			

VACCINE INFORMATION PERSUASIVENESS

I found that loss-framed vaccination messages were more likely to be persuasive than gain-framed messages. However, the differences were not significant. The persuasive power of vaccine messages that were presented with white text on a red background was stronger than was the persuasive power of those presented with white text on a blue background. However, this difference was not significant. Nevertheless, there was a significant interaction between message framing and color combination, which influenced how persuasive the

vaccine messages were. When a gain-framed message was used, there was no significant difference between the two different color combinations. However, when a loss-framed message was presented with white text on a red background, the persuasive power of the vaccine message was significantly greater compared with the persuasive power of white text on a blue background [$F(1, 116) = 7.77$, $p < .01$].

WILLINGNESS TO BE VACCINATED

I found that when messages were loss framed the respondents were more willing to get vaccinated than when the messages were gain framed. However, this difference was not significant. The respondents were more willing to be vaccinated when the message was presented in white text on a red background than when the message was presented in white text on a blue background. However, this difference was not significant. Nevertheless, there was a significant interaction between message framing and color combination, which influenced the respondents' willingness to be vaccinated. When a gain-framed message was used there was no significant difference between the two color combinations. However, when a loss-framed message was presented in white text on a red background the respondents' willingness to be vaccinated was significantly higher than it was when the message was presented in white text on a blue background [$F(1, 116) = 3.83$, $p < .05$].

DISCUSSION

I found that when compared with gain-framed messages, H1N1 vaccine information presented using loss-framed messages is more persuasive, and, as a result, the respondents were more willing to be vaccinated. In terms of color combination, presentation using white text on a red background was found to be more persuasive, and, correspondingly, the respondents were more willing to be vaccinated in comparison to a presentation in which white text was placed on a blue background. However, simply manipulating message framing variables or color combination variables did not result in a significant difference. Only when both message framing and color combination were controlled and vaccination messages were presented as loss framed with white text on a red background was the persuasive power of the message increased and the respondents' willingness to be vaccinated significantly enhanced which. My results were in line with the findings of McCaul and Johnson (2002) in that the exclusive promotion of vaccination via loss-framed messaging did not enhance the willingness of the respondents to be vaccinated. It was found that other factors need to be included in the design of the message for the respondents' decision to be influenced and to increase their willingness to be vaccinated. Although Abhyankar et al. (2008)

and Gerend and Sias (2009) found that loss-framed messages alone were able to influence the public and increase their willingness to be vaccinated, loss-framing alone was insufficient to enhance the willingness of our respondents to be vaccinated.

The findings in this study show that when white text on a red background was used in the design of vaccine-promoting materials the resultant message was interpreted by the student group of respondents in this study as a warning-equivalent loss-framed message, a finding similar to that gained by Laughery (2006). For targeting the young population in Taiwan, these results suggest that loss-framed picture-text messages using white text on a red background are the most effective, and that message framing and color combination should both be used so as to increase the willingness of young Taiwanese be vaccinated.

At present, the government in Taiwan most frequently uses gain-framed messages with bright, vivid colors to produce vaccine-promoting materials (Centers for Disease Control, 2010b). My findings in this study could serve as a reference for the design of healthcare-related materials in the future.

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