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Funny Enough: Incorporating Humor Into Health Messages to Promote Breast Self-Examination Behavior

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Using the extended parallel process model (PPM), this research examines whether and how humor functions to influence women's breast self-examination (BSE) intention. We conducted a 2 (humor: present vs. absent) × 2 (threat: high vs. low) × 2 (efficacy: high vs. low) between-subjects experiment in which we measured individual differences in BSE intention. The sample includes 480 Chinese women aged 20–50 years old. Results suggest that the 2-way interaction effect between threat and efficacy was significant, indicating that women who received messages containing high threat and high efficacy had the highest intention of BSE. In addition, the 3-way interaction effect between threat, efficacy, and humor was significant. The results indicate that if women perceive the threat of getting breast cancer as mild and believe that they are incapable of preventing it, messages with humor can significantly enhance their intention to engage in BSE when compared with messages without humor. Theoretical and practical implications of the findings are discussed.

Keywords: health messages, humor, breast cancer prevention

Health campaigns play a significant role in educating people about cancer-related information and persuading them to adopt and maintain healthy behaviors. Fear-induced persuasion has been widely used in health campaigns, and extensive research has supported the effectiveness of fear appeals in promoting individuals' health behaviors (Tannenbaum et al., 2015; Witte & Allen, 2000). Fear-appeal messages contain threats that alert people to potential hazards before following up with suggestions to aid in the avoidance of these threats. When messages combine threats and feasible responses, audiences are motivated to perform health behaviors to avert threats. Several theories have been proposed to explain individuals' reactions to fear-appeal messages; a predominant theory is the extended parallel process model (EPPM) developed by Witte (1992). Thus, this study adopts the EPPM as a theoretical basis.

However, fear appeals are not always successful. Earl and Albarracín (2007) found that the presence of fear appeals in HIV-prevention messages were associated with lower increases in prevention behaviors. Witte

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and Allen described the failure of fear appeals as fear-control responses in a meta-analysis with 13 studies: They found that when fear appeals trigger a high-perceived threat alongside a low-perceived efficacy, people subsequently engage in the fear-control response to address internal concerns, leading to defensive avoidance or reaction behaviors (Witte & Allen, 2000). Therefore, for serious health threats like cancer, people's perceived threat may be much higher than their perceived efficacy because of their scare of the diagnosis, leading them to avoid cancer screening. In this case, how do we cautiously balance the levels of threat and efficacy? Studies have proposed humor as a promising strategy, as when humor is used to promote cancer screening, fear about a cancer-detection behavior is effectively interrupted by the evocation of joy (Nabi, 2016). Nevertheless, previous studies of the effects of humor on persuasion have inconclusive results, and questions about the processing of humorous messages remain open (Walter, Cody, Xu, & Murphy, 2018).

Based on the EPPM, this study seeks to examine the causal relationship between the provision of fear-appeal messages describing the risks and precautions about breast cancer to women and their intentions to perform a breast self-examination (BSE). Furthermore, this study aims to examine the possible benefit of using humor to increase Chinese women's intention to perform BSE. BSE behavior was selected as the research context because it is a recommended detection method for early breast cancer screening (National Health Commission of People's Republic of China [NHCPRC], 2019) and can greatly reduce the mortality rate (Liu, Xia, Isaman, Deng, & Oakley, 2010).

The Extended Parallel Process Model

Fear-appeal messages based on the EPPM are widely used in health campaigns. The most recent fear-appeal model, the EPPM (Witte, 1992), serves as a message design theory that explains and predicts individuals' reactions to fear appeals (Maloney, Lapinski, & Witte, 2011). When designing fear-appeal messages to persuade target audiences, the messages should include a credible threat to their health or well-being that attracts audiences' attention and stimulates their perceptions of the threat, followed by feasible recommendations that could increase their perceived efficacy, such as a recommended behavior to aid in avoiding these threats. However, attention should be paid to controlling both threats and efficacy, as these may lead to undesirable outcomes, such as no response to the message or even message rejection (Witte, 1992). Overall, based on the EPPM, individuals' reactions to a fear-appeal message depends on their appraisals of two key constructs: threat and efficacy (Witte, 1992). The first construct, threat, is defined as the present dangers of harm around people (Witte, Cameron, McKeon, & Berkowitz,1996). It is usually composed of health hazards and consequences for individuals, thereby addressing self-orientation. It is important to note that, different from actual harm, threat focuses on the subjective perception of dangers. More specifically, perceived threat consists of two elements: perceived severity and perceived susceptibility. Perceived severity refers to the seriousness of the threat based on one's evaluation, whereas perceived susceptibility refers to the perception of the probability of experiencing the threat (Witte, 1992). Perceived threat determines the initial motivation to respond to fear-arousing messages (Maloney et al., 2011).

The second construct, efficacy, is defined as individuals' beliefs about their confidence in successfully performing a recommended response to avoid threats (Stephenson & Witte, 1998). If people perceive that they are susceptible to a serious threat, they are motivated to begin the second appraisal, which involves evaluating the efficacy of the recommended response in terms of perceived response efficacy and perceived self-efficacy.

Response efficacy refers to the effectiveness of the recommended response in deterring the threat, whereas self-efficacy refers to an individual's ability to perform the recommended response. According to the EPPM, perceived efficacy determines the nature of reactions (Maloney et al., 2011).

The application of EPPM consists of two stages. First, the threat in the messages should attract the audience's attention. After exposure to fear-appeal messages that contain threats, moderate-to-high evaluations about the degree of threat consequences would arouse feelings of fear (Easterling & Leventhal, 1989). Audiences would then enter the next stage of the appraisal process to evaluate the efficacy of the recommended responses. When individuals' perceptions of efficacy are higher than their perceptions of threat, they will enter the danger-control process. Accordingly, individuals change their perceptions, attitudes, intentions, and even actual behaviors to cope with the threat depending on the recommended responses (Witte, 1996). In contrast, when perceptions of efficacy are lower than those of threat, individuals will engage in a fear-control process and refuse to perform the recommended responses. More specifically, when fear appeals trigger a high-perceived threat alongside a low-perceived efficacy, individuals typically engage in defensive avoidance or reaction behaviors to address their internal concerns (Witte, 1996).

Studies of EPPM have revealed that fear-appeal messages can enhance individuals' perceived threat and perceived efficacy, thereby facilitating intentions and encouraging individuals to perform recommended behaviors (Morrison, 2005; Ordoñana, Gonzalez-Javier, Espin-Lopez, & Gomez-Amor, 2009; Tannenbaum et al., 2015; Witte & Allen, 2000). Furthermore, recent empirical studies indicated that threat and efficacy not only have main effect but also have interaction effect on behavioral intention (Sheeran, Harris, & Epton, 2014). EPPM has been widely tested in health contexts, such as COVID-19 (Roberto, Zhou, & Lu, 2021), breast cancer (Chen & Yang, 2018; Totzkay, Silk, & Thomas, 2022), HPV infection (Carcioppolo et al., 2013), and vaccination (Roberto, Mongeau, Liu, & Hashi, 2019). Especially, in the context of cancer-detection campaigns, Chen and Yang (2018) found that a greater perceived threat was associated with a stronger intention toward BSE when perceived efficacy was high. In summary, the interaction between threat and efficacy could influence the effectiveness of promoting BSE fear-appeal messages.

On the ground of new findings from meta-analysis, Witte and Allen (2000) proposed the additive model as a revised EPPM model, in which the effects of threat and efficacy are separate and independent, such that higher levels of each would lead to more persuasiveness. A meta-analysis also found that both threat and efficacy have main effects. Therefore, based on different results from the main and interaction effects of threat and efficacy, we posit that both threat and efficacy have main effects, and threat and efficacy have an interaction effect on intention to perform a BSE. Thus, we propose the following hypotheses:

H1: Message threat levels will have a main effect such that women who received messages containing a high threat will have a greater intention to perform BSE behavior than those who received messages containing a low threat.

H2: Message efficacy levels will have a main effect such that women who received messages containing a high efficacy will have a greater intention to perform BSE behavior than those who received messages containing a low efficacy.

H3: Message threat and efficacy levels will interact such that an intention to perform BSE behavior will be greatest for women who received messages containing both high threat and high efficacy.

The Persuasion Process of Humor

Humor is a frequently used persuasion strategy and has received much attention in fields such as marketing (Weinberger & Gulas, 2019), advertising (Blanc & Brigaud, 2014; Durkin, Bayly, Brennan, Biener, & Wakefield, 2018; Yoon & Tinkham, 2013), public service (Jäger & Eisend, 2013; Yoon, 2015a), and environmental communication. How humor is coded, delivered, and interpreted may differ by discipline and topic. However, in most persuasion studies focused on humor, humor is often operationally defined as the opposite of a serious message and scores higher on a perceived humor scale (Walter et al., 2018). A meta-analysis of 89 studies across various fields reveals that humor has a weak and significant effect on attitudes (r = .12, N = 10398) and behavioral intent (r = .09, N = 4731; Walter et al., 2018). Compared with messages without humor, messages with humor induced greater climate change activism intentions (Skurka, Niederdeppe, Romero-Canyas, & Acup, 2018). Nevertheless, a study on public service advertisements suggests that although the overall effectiveness was similar, the emotional and cognitive responses underlying the persuasion processes of messages with humor were different (Yoon, 2015b). Therefore, more empirical efforts are needed about the proposition of cognitive responses underlying the persuasion process of messages with humor (Walter et al., 2018).

Humor has a long history in health campaigns; for instance, 23% of the 399 advertisements from the American Media Campaign Resource Center incorporated humor to antismoking messages (Cohen, Shumate, & Gold, 2007). Humor as a persuasion strategy has received extensive attention in health communication, such as alcohol and tobacco use, obesity, HIV/AIDS, and HPV prevention (Blanc & Brigaud, 2014; Hendriks & Janssen, 2018; Lee & Shin, 2011; Soscia, Turrini, & Tanzi, 2012; Yoon, 2018). Soscia, Turrini, and Tanzi (2012) suggest that messages with humor are less effective on behavior change than those without humor, and similar results were found in antismoking campaigns (Lee & Ferguson, 2002). However, alcohol, tobacco, and obesity ads with humor received prolonged attention and were deemed more convincing (Blanc & Brigaud, 2014).

Humor plays a role in the persuasion process in four main ways: First, humor increases people's attention to the message and generates positive emotions. However, it has the potential to reduce the perceived credibility of the source (Eisend, 2011). Second, humor decreases people's resistance to the message and thus increases the acceptance of the message. This effect is particularly significant in the case of resistance to fearful emotions (Mukherjee & Dubé, 2012). Third, humor reduces self-exam anxiety and facilitates a more positive attitude toward the recommended behavior in the message (Nabi, 2016). Fourth, for cognitive responses, humor generates a lower perceived threat, but the presence or absence of humor did not have a significant impact on perceived efficacy (Yoon, 2015a).

As the only study to date that addresses cancer screening behavior, Nabi's (2016) experiment presents a model that includes message processing motivation, self-exam anxiety, and self-exam attitude. The results of the model showed that humor directly reduced self-exam anxiety and increased message processing motivation, which, in turn, indirectly related to more positive attitudes toward self-exams. However, the humor did not enhance the intention to perform cancer-screening behavior. These findings add to our understanding of the relationship between humor and information processing, self-detection anxiety, and self-detection attitudes. However, there may be other not-yet-considered pathways in which humor plays a role in the persuasion process for cancer-detection behavior, such as cognitive responses like perceived threat and perceived efficacy, which the current study seeks to examine.

The positive-affection humor brings can help relieve anxiety and regulate stress in specific situations. Thus, when people face a situation in which they feel stressed, humor helps alleviate anxiety by reframing or creating a different perspective (Martin & Ford, 2018). An interesting study found that for participants with arachnophobia, humorously reframing the act of touching a spider effectively reduced participants' anxiety about spiders (Ventis, Higbee, & Murdock, 2001). Therefore, humor might help people reframe a frightening disease-detection behavior through its influence on two cognitive responses (perceived threat and perceived efficacy). Thus, we predict that:

H4: Humor will have a main effect such that women who received a message with humor will have a greater intention to perform BSE than those who received a message without humor.

Fear-Appeal Messages With Humor

As the latest model of fear appeals, EPPM integrates the two cognitive-appraisal processes, the threat-appraisal and coping-appraisal processes, postulated by protection-motivation theory, and parts of the fear-as-acquired drive model into the explanatory framework of the parallel process model (PPM). The EPPM also adopts PPM's two distinct reactions to fear appeals, danger control and fear control, to illuminate the responses that may occur after the two cognitive-appraisal processes.

According to Plutchik's circumplex models of emotion (Plutchik, 1980), an emotional state will be interrupted by evoking the most unrelated affective state, and the states most unrelated to fear are joy and sadness. Therefore, fear about cancer-detection behavior could be effectively interrupted by the evocation of joy. In other words, rather than acknowledging that cancer is scary and encouraging people to overcome their psychological barriers to performing a BSE, humor may disrupt such barriers at the start. Adding humor to the message is a possible way to disrupt the extreme fear triggered by breast cancer, thereby enhancing women's intentions to perform a BSE.

In addition, to cope with the greater fear that disease-detection behavior evokes compared with other health behaviors, positive affection provoked by humor may increase women's perceived efficacy and, in turn, greater intentions to perform a BSE. The efficacy in health campaigns is usually divided into two aspects: behavioral efficacy, the belief that the suggested health behavior can be effective in coping with the risk; and self-efficacy, the belief that one can perform the suggested health behavior to cope with the risk. However, both of these aspects are cognitive appraisals, whereas humor, as an affective appraisal, may enhance the overall perceived efficacy through an affective pathway.

Studies of the persuasive process of humor that involve threat and efficacy have mixed results. Scholars found that when people receive both high-threat and high-efficacy messages, a message with humor has a higher level of acceptance compared with a standard fear-based message (Lewis, Watson, & White, 2013), suggesting that a message with humor may be more persuasive. Nevertheless, Nabi (2016) found that messages with or without humor did not generate differences in self-exam behavior, though the intention-behavior relationship was stronger and more significant for those exposed to messages with humor. Meanwhile, there is still a lack of comparison of the persuasive effects of EPPM messages with or without humor. Despite its long history in communication, scholars continue to debate whether humor enhances or undermines persuasive attempts. Thus, further evidence is needed to illuminate the relationship between humor and persuasive effects on intention to perform cancer-detection behaviors. Further, there is still a lack of research to clarify how humor influences the intention to perform cancer-detection behaviors through the perception of threat or efficacy. Thus, the following research question was developed:

RQ1: To what extent and how does a message with humor influence women's BSE intention?

Method

Participants

Participants were sampled from an online panel of approximately 2.6 million registered users maintained by *Sojump*, one of the most frequently employed professional survey companies in China. The company randomly sent the questionnaires to a panel of female members aged between 20 and 50 and who were residents of China (*M* = 28.32, *SD* = 8.76, *N* = 480). Only 20–50-year-old females were selected because of the higher risk of breast cancer among women above age 20; thus, this age group is especially likely to benefit from BSE. We assessed the following demographics: age, gender, education, and regions. Related demographics were considered potential variables that might confound the results of the experiment. Most of the participants have a bachelor's degree (79.8%). About the regions from which the participants came, 38.3% of the sample were from metropolitan cities, 25.6% from first-tier cities, 21.3% from second-tier cities, and 14.8% from towns and villages. For background, 19.8% of the sample surveyed had a history of breast disease, while 80.2% did not. To ensure sufficient power, we ran a priori power analysis using G*Power (Faul, Erdfelder, Buchner, & Lang, 2009) before data collection. Given the 2 × 2 × 2 between-subjects design, the results suggested that the total sample size should be more than 299 (power = 0.85, α = .05). The current study recruited 480 participants, which means the criteria were met.

Experimental Design

This study was a 2 × 2 × 2 factorial experiment that used a between-subjects design, where all participants were randomly assigned into eight groups. These groups were subsequently assigned to eight different experimental conditions. Random assignment was employed in this study to ensure the homogeneous treatment groups, without involving any potential biases. These conditions were created by crossing three factors: humor (present, absent), threat (low, high), and efficacy (low, high; see Appendix A).

Procedure

A total of 480 Chinese women were recruited to participate in this study, 60 for each experimental condition. One hyperlink out of the eight available was randomly e-mailed to participants. In the Web-based questionnaire found in each hyperlink, participants were first required to complete an eligibility assessment. Only Chinese females who were 20 to 50 years old were allowed to continue the Web-based questionnaire. After confirming the participants' eligibility, an online informed consent form was presented to obtain their permission.

The study was introduced as research interested in people's reactions to messages about health-related issues. After consenting procedures, participants were exposed to one of the eight posters that encouraged BSE behavior in the Web-based questionnaire. Participants could proceed to the final stage of the questionnaire only upon viewing the poster for at least 30 seconds. Then participants were required to evaluate their intentions of performing BSE behavior and their perceptions of the threat and efficacy of the stimuli. Finally, upon completion of the questionnaire, an online debriefing form was presented to participants. This debriefing form provided clarification on the real purpose of this study, which was to conduct an experiment using a Web-based questionnaire to examine the influence of threat, humor, and efficacy of stimuli on intention to perform a BSE.

Stimulus

The posters were designed loosely based on existing BSE promotion posters from the Chinese Breast Cancer Foundation and the Singapore Breast Cancer Foundation (see Appendix A). The humorous element in the humor poster is an image of a body paint of a cartoon female who is squeezing acne, but the acne is actually the nipple of the body, and presents the text, "Are you obsessed with the right point?" This example can be construed as a "pun." According to *The Webster's Third International Dictionary*, a pun can be defined as "a humorous use of a word in such a way as to suggest different meanings or applications" (*Merriam-Webster*, n.d.). In the humor-absent poster, the image is replaced by a picture of a carton female, and her hands are covering her breasts. We use Lee and Ferguson's (2002) scale to ask participants how they felt after viewing the posters. Participants found humorous posters funny (*M* = 4.83, *SD* = 0.77, Cronbach's α = .89) and standard EPPM posters frightful (*M* = 5.63, *SD* = 0.69, Cronbach's α = .86).

All posters consisted of both threat and efficacy components with low or high levels. All threat components included severity and susceptibility content, while all efficacy components contained self-efficacy and response-efficacy content. In sum, these posters consisted of (1) high threat and high efficacy with humor, (2) high threat and low efficacy with humor, (3) low threat and high efficacy with humor, (4) low threat and low efficacy with humor, (5) high threat and high efficacy without humor, (6) high threat and low efficacy without humor, (7) low threat and high efficacy without humor, and (8) low threat and low efficacy without humor. Finally, these posters were embedded within eight different Web-based questionnaires, respectively.

Measures

The scale used to measure the threat and efficacy levels of the stimuli in this research was drawn and modified from the Risk Behavior Diagnosis Scale (Witte, Meyer, & Martell, 2001).

Perceived threat was measured by using six items that asked participants to rate their levels of agreement with the statement on a 7-point Likert scale (1 = strongly disagree and 7 = strongly agree). Specifically, the participants were asked about the following statements: (1) I am at risk for experiencing breast cancer; (2) I think I will probably experience breast cancer; (3) I am susceptible to experiencing breast cancer; (4) Breast cancer is a serious threat; (5) Breast cancer is harmful; and (6) Breast cancer is a serious concern. All items were averaged to create a scale for threat levels, in which higher scores indicated higher levels of perceived threat (*M* = 4.86, *SD* = 1.46, Cronbach's α = .91).

Perceived efficacy was measured by using six items that asked participants to indicate their levels of agreement on a 7-point Likert scale (1 = strongly disagree and 7 = strongly agree). The items were presented as follows: (1) BSE is an effective way to prevent breast cancer; (2) Regular BSE can detect breast cancer earlier; (3) BSE helps avoid breast cancer; (4) The material taught me how to perform a BSE clearly; (5) After reading the material, I am capable of performing a BSE; (6) It is easy for me to perform a BSE. All items were then averaged to create a scale for efficacy levels, in which higher scores indicated higher levels of perceived efficacy (*M* = 4.86, *SD* = 1.38, Cronbach's ɑ = .89).

The intention to perform BSE was measured by using three items based on previous studies about EPPM and behavioral intentions (Chen & Yang, 2018), in which participants were asked to indicate their levels of agreement on a 7-point Likert scale (1 = strongly disagree and 7 = strongly agree) as follows: (1) I intend to perform a BSE, (2) I will try to perform a BSE, and (3) I plan to perform a BSE (*M* = 5.09, *SD* = 1.42, Cronbach's ɑ= .92).

Demographic questions, such as asking for the participant's age, gender, educational background, regions, and nationality, were used to exclude ineligible participants.

Analytic Approach

First, we conducted a series of chi-square and one-way analyses of variance to check the success of random assignment of the experiment. In a second step, as this study used a between-subjects experimental design, the independent sample t-test was conducted to examine perceptions of the levels of threat and efficacy of the stimuli. Last, we applied a three-way analysis of covariance (*ANCOVA*) model with age, education, and regions as covariates to differentiate the direct effects of humor, threat levels, efficacy levels, and the effect of their interaction on participants' intention to perform a BSE (H1, H2, H3, H4, RQ1).

Results

Randomization Check

To check the success of random assignment of the experiment, we conducted a series of chi-square and one-way analyses of variance. We found participants differ on age (*F* [7, 472] = 2.17, *p* < .05), education (F [7, 472] = 3.77, *p* < .05), and region (χ^2 [21] = 44.25, *p* < .01) across eight conditions. Therefore, to avoid these variables confounding the results of the experiment, age, education, and region serve as covariates in the analysis of covariance in this study.

Manipulation Check

The humor manipulation was again successful; participants found posters with the humor element funny (*M* = 4.83, *SD* = 0.77, Cronbach's ɑ = .89), and posters without the humor element frightful (*M* = 5.63, *SD* = 0.69, Cronbach's ɑ = .86). As this study used a between-groups experimental design, comparing individuals in eight separate groups, the threat and efficacy levels of the stimuli need to be assessed. The independent sample t-test was conducted to examine perceptions of the levels of threat and efficacy of the stimuli. The results indicated that participants who received high-threat stimuli perceived significantly higher levels of threat (*M* = 5.65, *SD* = 1.06) than those who received the low-threat stimulus (*M* = 4.06, *SD* = 1.37), implying that the high-threat stimulus created a significantly higher level of threat than the low-threat stimulus, *t* (478) = 14.17, *p* < .001. In addition, the results also revealed that perceptions of efficacy level for the stimulus with a high efficacy level (*M* = 5.69, *SD* = 1.05) were significantly higher than that of the stimulus with a low efficacy level (*M* = 4.04, *SD* = 1.16), *t* (478) = 16.38, *p* < .001.

Furthermore, messages that can have an impact on all four EPPM factors are considered as the most effective (Sheeran et al., 2016). The results of the t-test for each factor indicated that participants who received high-threat stimulus tended to have higher-perceived susceptibility and severity compared with those who received low-threat stimulus (see Table 1). Similarly, participants who received high-efficacy stimulus perceived higher self-efficacy and response-efficacy than those who received low-efficacy stimulus (see Table 1). Thus, the results of the manipulation test revealed that participants' perceptions were consistent with the threat and efficacy settings designed for the experiment.

Table 1. Four EPPM Factors' Perceptions in Each Condition.

Perception	*M*	*SD*	*t*	*p*
High susceptibility	5.06	1.55	12.94	< .001
Low susceptibility	3.22	1.56		
High severity	6.24	0.94	10.82	< .001
Low severity	4.91	1.67		
High self-efficacy	5.56	1.19	20.19	< .001
Low self-efficacy	3.14	1.44		
High response efficacy	5.82	1.12	7.63	.016
Low response efficacy	4.94	1.40		

Note. In all conditions, *n* = 240.

Main Analysis of Hypotheses and Research Questions

Table 2 shows the results of a descriptive analysis of participants' intentions to perform a BSE under different conditions of threat, efficacy, and humor. A three-way analysis of covariance (*ANCOVA*) was conducted to examine the effects of threat, efficacy, and humor on the participants' behavioral intentions to perform a BSE, with age, education, and regions serving as covariates (see Table 3).

Table 2. Descriptive Statistics for Intentions to Perform a BSE.

Threat	Efficacy	Humor	*M*	*SD*	*N*
Low	Low	Yes	4.27	1.43	60
		No	3.70	1.05	60
		Total	4.21	1.35	120
	High	Yes	5.11	1.57	60
		No	5.72	1.19	60
		Total	5.42	1.42	120

	Total	Yes	4.92	1.51	120
		No	4.71	1.51	120
		Total	4.81	1.51	240
High	Low	Yes	5.11	1.11	60
		No	4.88	1.43	60
		Total	4.99	1.28	120
	High	Yes	5.71	1.13	60
		No	5.73	1.15	60
		Total	5.72	1.14	120
	Total	Yes	5.41	1.16	120
		No	5.30	1.36	120
		Total	5.36	1.26	240
Total	Low	Yes	4.92	1.29	120
		No	4.29	1.39	120
		Total	4.61	1.34	240
	High	Yes	5.41	1.40	120
		No	5.73	1.17	120
		Total	5.57	1.29	240
	Total	Yes	5.16	1.36	240
		No	5.01	1.47	240
		Total	5.09	1.42	480

Table 3. ANCOVA Results for Intentions to Perform a BSE.

Factors	*F* (1,469)	partial η^2	*p*
Age	6.28	0.01	.013
Education	3.22	0.01	.073
Regions	7.39	0.02	.007
Threat	18.95	0.04	< .001
Efficacy	63.47	0.12	< .001
Humor	2.02	0.00	.156
Threat × Efficacy	4.35	0.01	.037
Threat × Humor	0.26	0.00	.610
Efficacy × Humor	13.21	0.03	< .001
Threat × Efficacy × Humor	9.69	0.02	.002

Note. *N* = 480.

According to Table 3, the results revealed a significant main effect for the level of threat. Participants who received high-threat messages had a higher intention to perform a BSE ($M = 5.36$, $SD = 1.26$), while those who received low-threat messages had a lower intention to perform a BSE ($M = 4.81$, $SD = 1.51$), $F(1, 469) = 18.95$, $p < .001$, partial $\eta^2 = 0.04$. The results also showed a significant main effect for efficacy; participants who were exposed to high-efficacy messages tended to have a higher intention to perform BSE (*M* = 5.57, *SD* = 1.29) than those who were exposed to low-efficacy messages (*M* = 4.6, *SD* = 1.37), *F* (1, 469) = 63.47, $p < .001$, partial $\eta^2 = 0.12$. Thus, H1 and H2 were supported. However, the main effect of humor was not significant. Thus, H4 was rejected.

The interaction between threat and efficacy had a significant effect on BSE intention, *F* (1, 469) = 4.35, $p < .05$, $\eta^2 = 0.01$. Thus, H3 was supported. We also found that the interaction between efficacy and humor had a significant effect on BSE intention, *F* (1, 469) = 13.21, $p < .001$, $\eta^2 =0.03$. As Figure 1 shows, for participants who received a low-efficacy message, a message with humor was more effective than a message without humor, *M* = 4.92 versus 4.29. For participants who received a high-efficacy message, a message with humor was less effective than a message without humor, *M* = 5.41 versus 5.73. However, we found that the interaction between threat and humor did not have a significant effect on BSE intention, *F* (1, 469) = 0.26, *p* = 0.61.

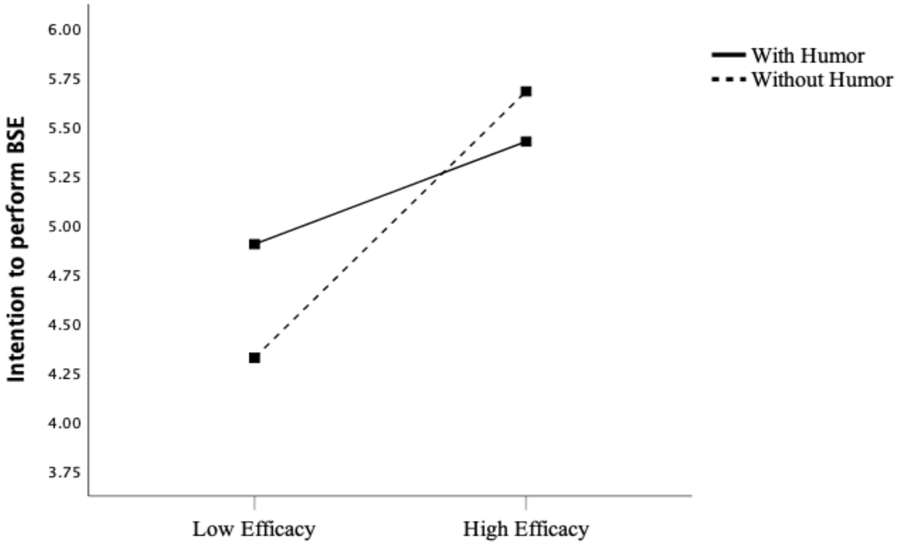
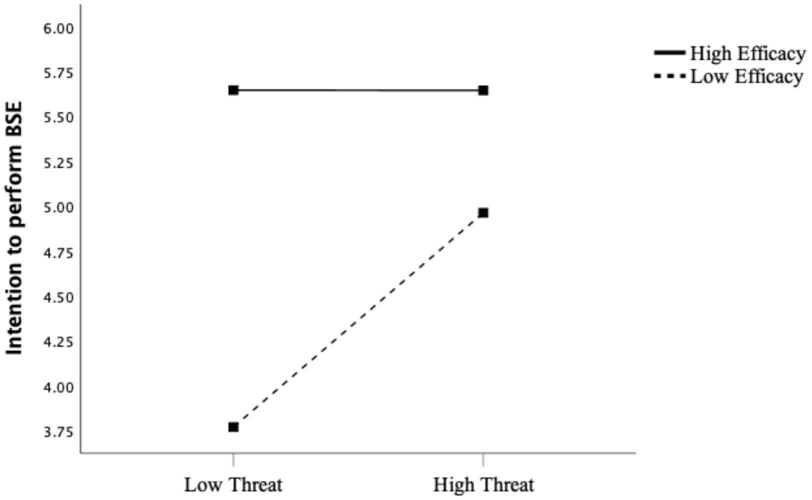


Figure 1. Two-way interaction of efficacy and humor on intention to perform a BSE.

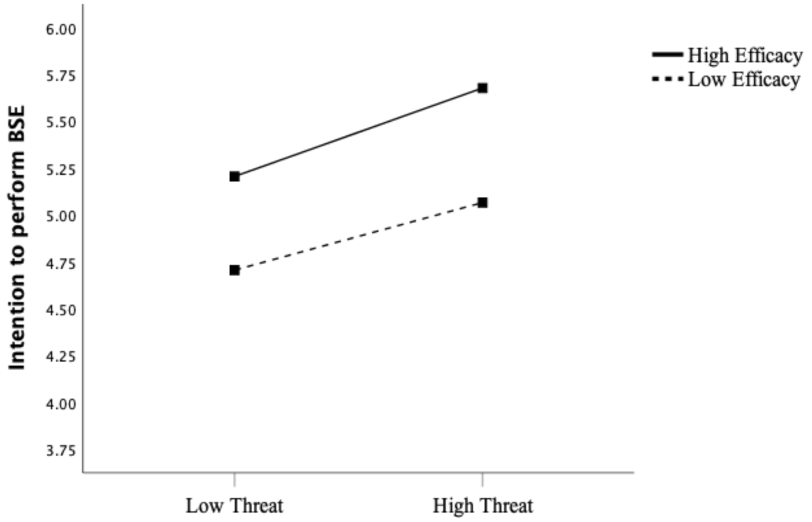
RQ1 asks to what extent and how a message with humor influences women's BSE intentions. First, the interaction between humor and efficacy has a significant effect on participants' BSE intentions. However, the main effect of humor on BSE intention was not significant.

In terms of the interactive effect among threat, efficacy, and humor, a significant three-way interaction was found on intention to perform a BSE (*F* (1,469) = 9.69, *p* = .00, partial $\eta^2= 0.02$). As Figure 2b shows, in the humor condition, participants who received a message containing high threat and high efficacy (*M* = 5.71, *SD* = 1.13) showed greater intention than those who received a message containing low threat and high efficacy (*M* = 5.11, *SD* = 1.57), a message containing high threat and low efficacy (*M* =

5.11, *SD* = 1.11), or a message containing low threat and low efficacy (*M* = 4.27, *SD* = 1.43). As Figure 2a shows, in the humor-absent condition, participants who received a message containing high threat and high efficacy (*M* = 5.73, *SD* = 1.15) showed slightly greater intention to perform a BSE than those who received a message containing low threat and high efficacy (*M* = 5.72, *SD* = 1.19), and much greater intention to perform a BSE than those who received a message containing high threat and low efficacy (*M* = 4.88, *SD* = 1.43) or a message containing low threat and low efficacy (*M* = 3.70, *SD* = 1.05). Thus, RQ1 was answered.



(a) Without humor



(b) With humor

Figure 2. Three-way interaction of threat, efficacy, and humor on intention to perform a BSE.

Discussion

This study investigated whether and how humor increases the intention to perform disease-detection behavior through its interaction with threat and efficacy. Through the between-subjects experiment, this research examined the BSE intention of Chinese females exposed to EPPM messages with and without humor. The results demonstrate that the influence of humor on cancer-detection behavioral intention differs depending on the threat and efficacy components in the message, indicating that focusing on humor without considering other cognitive factors might be overly simplistic. Four main observations are discussed.

First, the persuasive effect of EPPM messages with humor on behavioral intention was examined. The results of the current study suggest that intention to perform a BSE was the strongest for females who received high-threat and high-efficacy messages with humor. This revealed that EPPM could be used as a theoretical framework for messages with humor, which is in line with previous research (Lewis et al., 2013). Furthermore, this finding sheds light on the affective appraisal of EPPM in addition to its cognitive appraisal and provides empirical support for the future application of EPPM to a wider range of messages.

Second, we observed an interaction effect between humor and efficacy. By comparing efficacy levels, we found these constructs have asymmetric effects on people’s cancer-detection intention. The results demonstrate that when efficacy is highlighted, a message without humor is more likely to lead to an increased intention to perform disease-detection behavior than a message with humor. One possible explanation is that when people are threatened by an EPPM message, the message that emphasizes a sense of efficacy can make people more proactive in confronting this fear and therefore generate a stronger willingness to engage in the recommended behavior.

Third, a message with humor has an advantage when people perceive low efficacy. Despite the weak meta-analytic support for the role of humor in persuasion (Walter et al., 2018), we found that messages with humor were consistently more effective than those without humor when the efficacy level was low. Maloney et al. (2011) review of EPPM suggests that people who received a message containing low threat and low efficacy will have the lowest behavioral intention, and we found similar results in the current study. However, the results of our experiment revealed that when people perceive both low threat and low efficacy, messages with humor can significantly increase their intention to engage in recommended health behaviors compared with messages without humor. Therefore, in future health campaigns, messages with humor should be used more for an issue that is low in efficacy.

Fourth, in addition to the moderating effect of age in humor and persuasion, a three-way analysis of covariance (ANCOVA) was conducted, with age serving as one of the covariates. As expected, we observed that age is an important moderator of the persuasion process. This is in line with studies that showed humor is more effective for the relatively younger adult populations (Eisend, 2009; Madden & Weinberger, 1984; Skurka et al., 2018; Skurka, Romero-Canyas, Joo, Acup, & Niederdeppe, 2021). A possible explanation is that young adults are more self-focused and unstable (Arnett & Tanner, 2006) and are still in the stage of identity development (Arnett, Ramos, & Jensen, 2001). Thus, they may be attracted to messages presented in compelling ways. Because humor is effective in attracting attention (Eisend, 2009), humorous messages about health issues may be of greater interest to emerging adults.

Implications and Limitations

This study has several theoretical and practical implications. First, this research expands and deepens the humor persuasion-communication literature by examining the application and causal effects of messages with humor in the cancer-detection context. In addition, this article demonstrates that the persuasive effect of humor depends on the threat and efficacy levels. This finding sheds light on the affective appraisal of EPPM in addition to its cognitive appraisal and provides empirical support for the future application of EPPM to a wider range of emotion-aroused persuasion studies.

Second, our findings have crucial implications for health-communication practitioners. We suggest that perceived threat and efficacy determine whether humor should be used in health messages. Health messages that include high efficacy, high threat, and humor are the most persuasive. In addition, compared with humorous video advertisements commonly used in humor studies (Lewis et al., 2013; Nabi, 2016), humorous posters showed significant persuasive effects on behavioral intention. Future health-communication practitioners could make greater use of humorous posters in a more cost-effective way.

As with all research, there are limitations to this work. First, the current study focused on messages with or without humor but did not control for other emotions that might be evoked during the experiment, such as offense and embarrassment. The emotional arousal caused by stimuli can be very complex; future research could attempt a more comprehensive measure of emotional arousal from health messages and further discuss the effectiveness of humor in persuasion. Second, like most studies, the current study mainly focused on the danger-control process of EPPM but did not consider fear control and defensive avoidance. Future studies could measure and explore both fear control and danger control. Third, the current research merely examined group differences in terms of the general threat and efficacy. Thus, further examination could be conducted in the future to control the group’s distinctiveness in terms of different levels of severity, susceptibility, self-efficacy, and response efficacy. Fourth, the experiment was conducted in an online setting, which may confound the results. Future studies should replicate this experiment in the offline environment to validate the findings. Fifth, this study examined participants’ behavioral intentions to perform a BSE rather than their actual behaviors. Although prior research has provided evidence for the translation of behavioral intentions to actual behavior (Peters, Ruiter, & Kok, 2013), future research could examine the extent to which behavioral intentions are translated into actual BSE behaviors.

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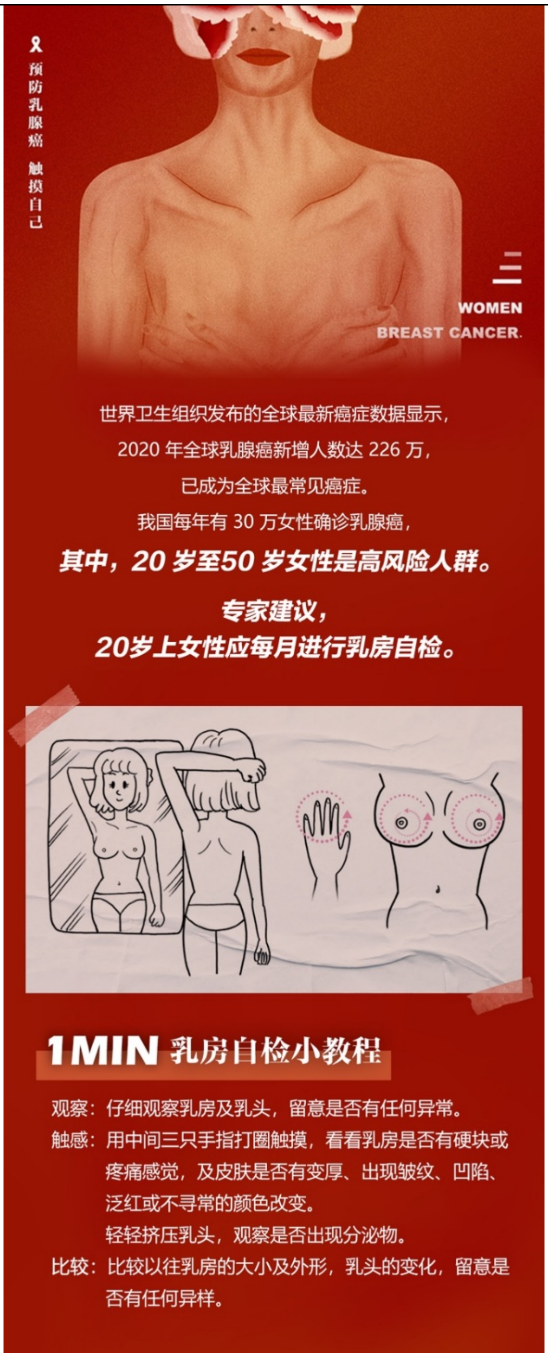
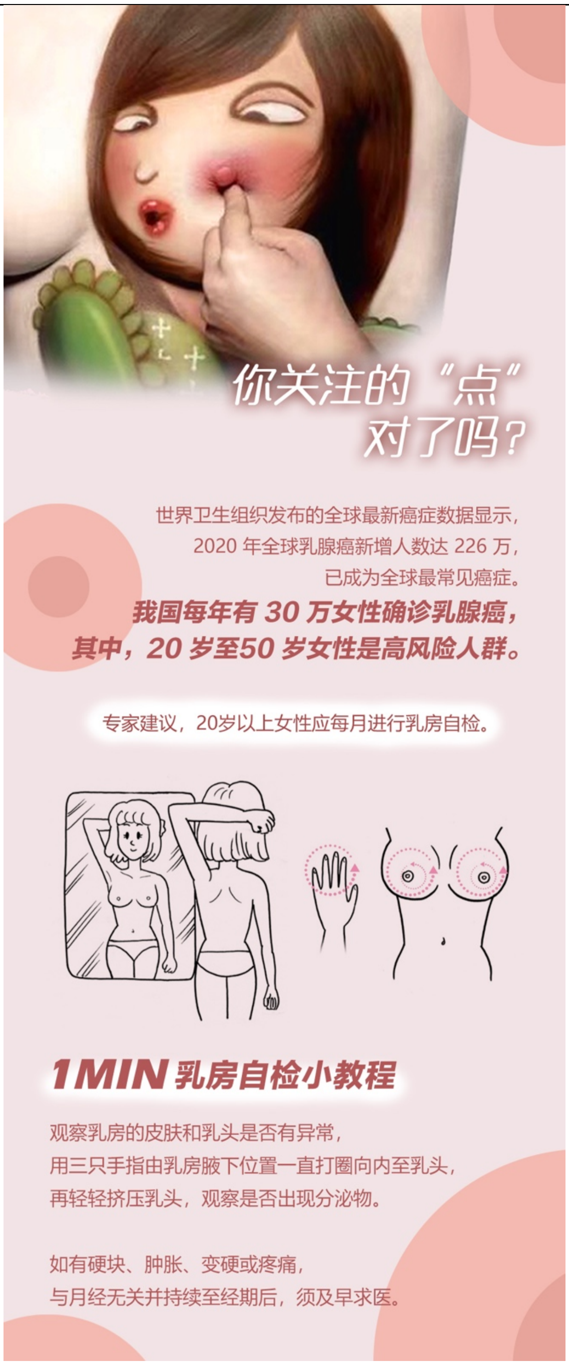
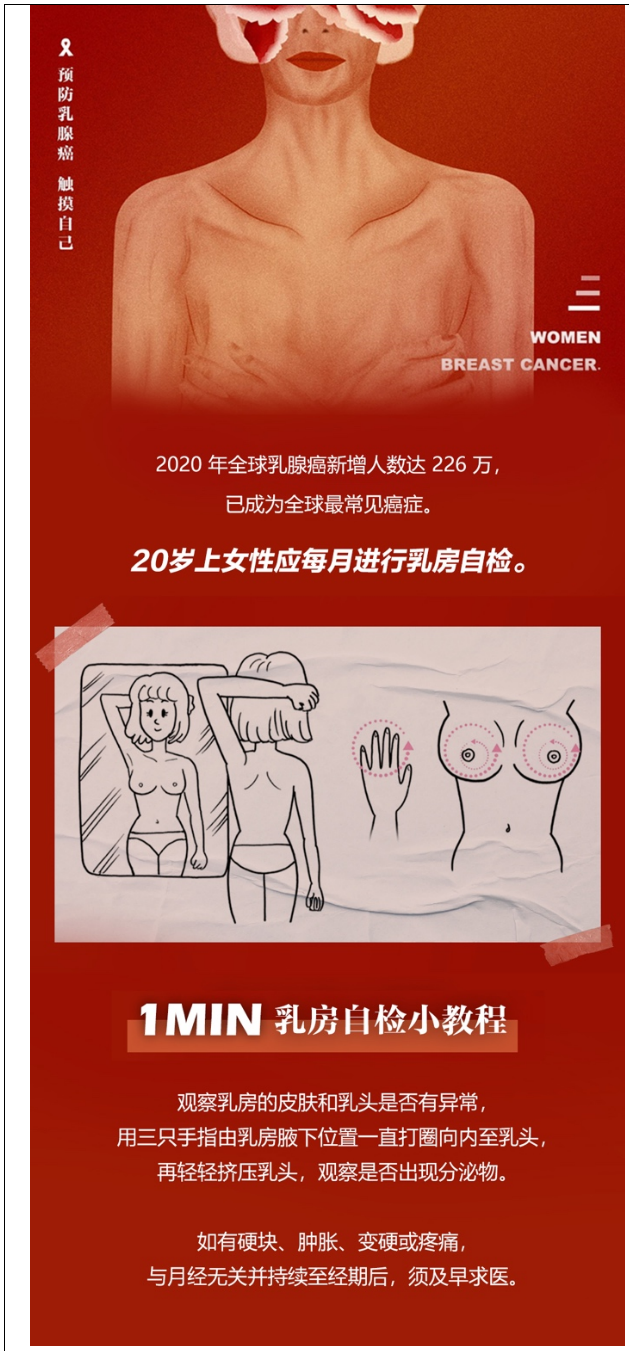
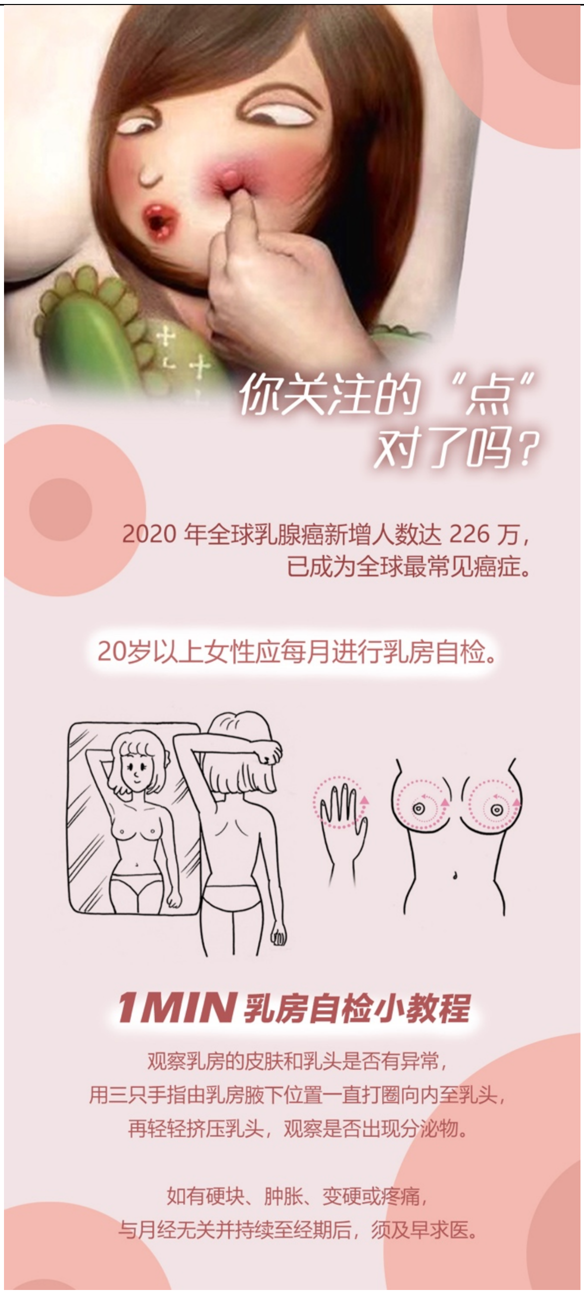
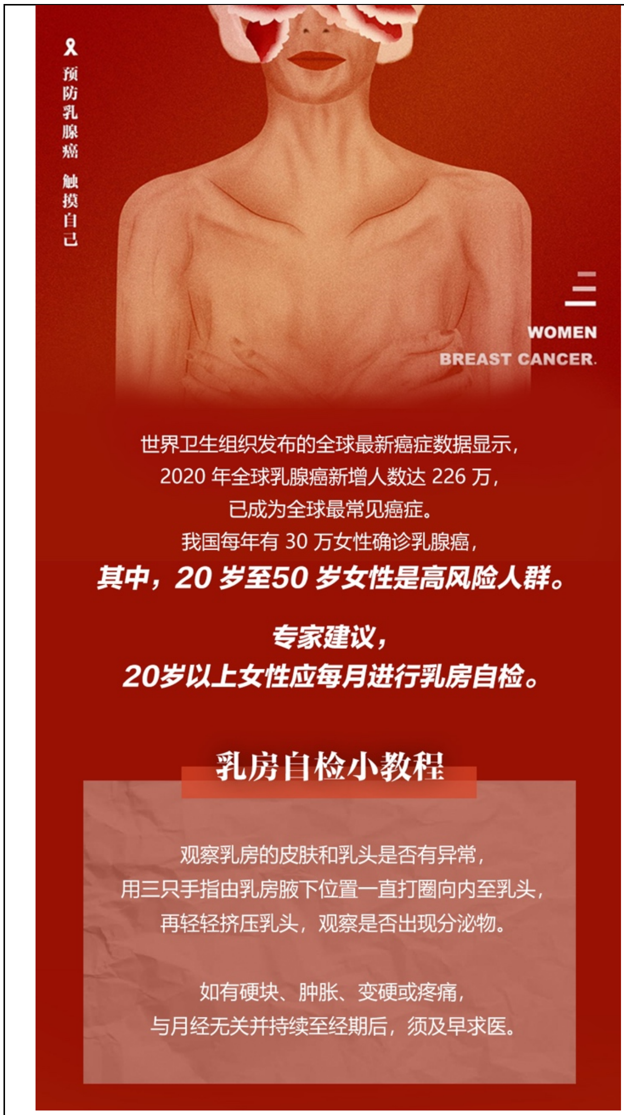
Appendix A. Posters Used in Experiments With English Translations

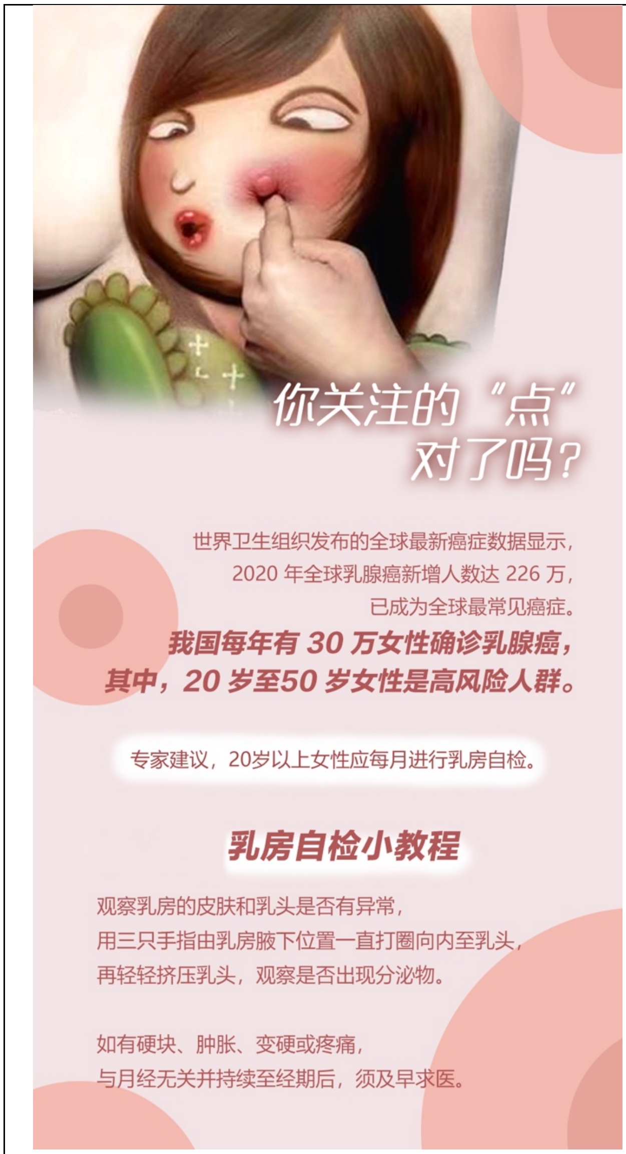
 预防乳腺癌 触摸自己 WOMEN BREAST CANCER. 世界卫生组织发布的全球最新癌症数据显示， 2020 年全球乳腺癌新增人数达 226 万， 已成为全球最常见癌症。 我国每年有 30 万女性确诊乳腺癌， **其中，20 岁至50 岁女性是高风险人群。** **专家建议，** **20岁上女性应每月进行乳房自检。** **1MIN 乳房自检小教程** 观察：仔细观察乳房及乳头，留意是否有任何异常。 触感：用中间三只手指打圈触摸，看看乳房是否有硬块或疼痛感觉，及皮肤是否有变厚、出现皱纹、凹陷、泛红或不寻常的颜色改变。 轻轻挤压乳头，观察是否出现分泌物。 比较：比较以往乳房的大小及外形，乳头的变化，留意是否有任何异样。	**Condition 1: High threat and high efficacy without humor** “The latest global cancer data released by the World Health Organization shows that the number of new breast cancers worldwide in 2020 reached 2.26 million, which has become the most common cancer worldwide. In China, 300,000 women are diagnosed with breast cancer every year, and among them, women aged 20 to 50 are the high-risk group. Experts suggest that women over 20 years old should perform monthly breast self-examinations.” “1-minute breast self-examination tutorial: Observe the skin of the nipple and the nipple for abnormalities; use three fingers to circle from the position of the armpit of the breast all the way inward to the nipple, and then gently squeeze the nipple to observe if there is any discharge. Seek medical advice promptly if there is lumpiness, swelling, hardening, or pain that is not related to menstruation and persists until after your period.”

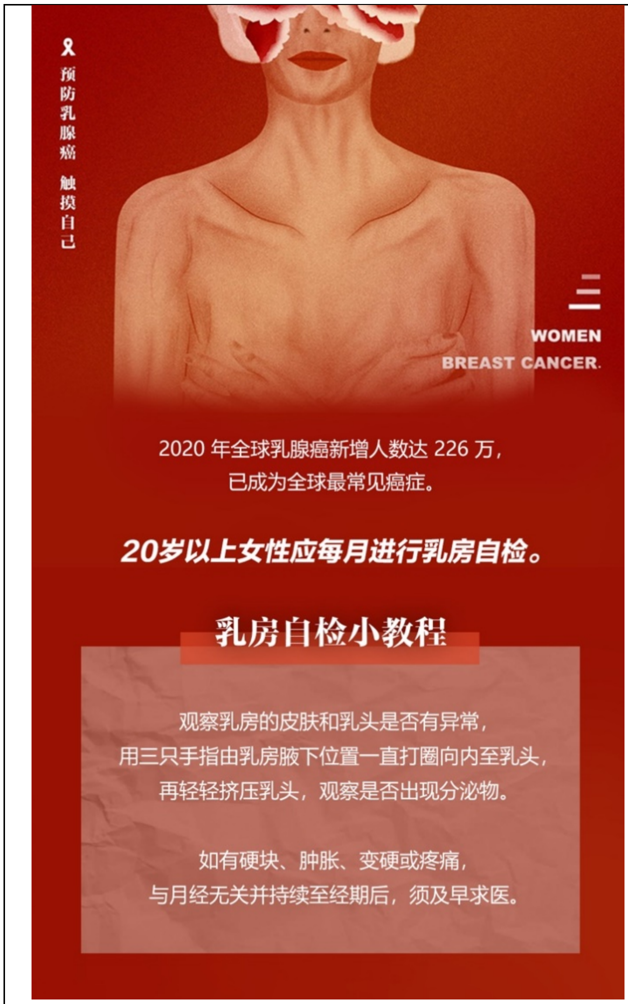
 你关注的"点"对了吗？ 世界卫生组织发布的全球最新癌症数据显示， 2020 年全球乳腺癌新增人数达 226 万， 已成为全球最常见癌症。 **我国每年有 30 万女性确诊乳腺癌，** **其中，20 岁至50 岁女性是高风险人群。** 专家建议，20岁以上女性应每月进行乳房自检。 **1MIN 乳房自检小教程** 观察乳房的皮肤和乳头是否有异常， 用三只手指由乳房腋下位置一直打圈向内至乳头， 再轻轻挤压乳头，观察是否出现分泌物。 如有硬块、肿胀、变硬或疼痛， 与月经无关并持续至经期后，须及早求医。	**Condition 2: High threat and high efficacy with humor** “Are you obsessed with the right ‘point’?” “The latest global cancer data released by the World Health Organization shows that the number of new breast cancers worldwide in 2020 reached 2.26 million, which has become the most common cancer worldwide. In China, 300,000 women are diagnosed with breast cancer every year, and among them, women aged 20 to 50 are the high-risk group. Experts suggest that women over 20 years old should perform monthly breast self-examinations.” “1-minute breast self-examination tutorial: Observe the skin of the nipple and the nipple for abnormalities; use three fingers to circle from the position of the armpit of the breast all the way inward to the nipple, and then gently squeeze the nipple to observe if there is any discharge. Seek medical advice promptly if there is lumpiness, swelling, hardening, or pain that is not related to menstruation and persists until after your period.”

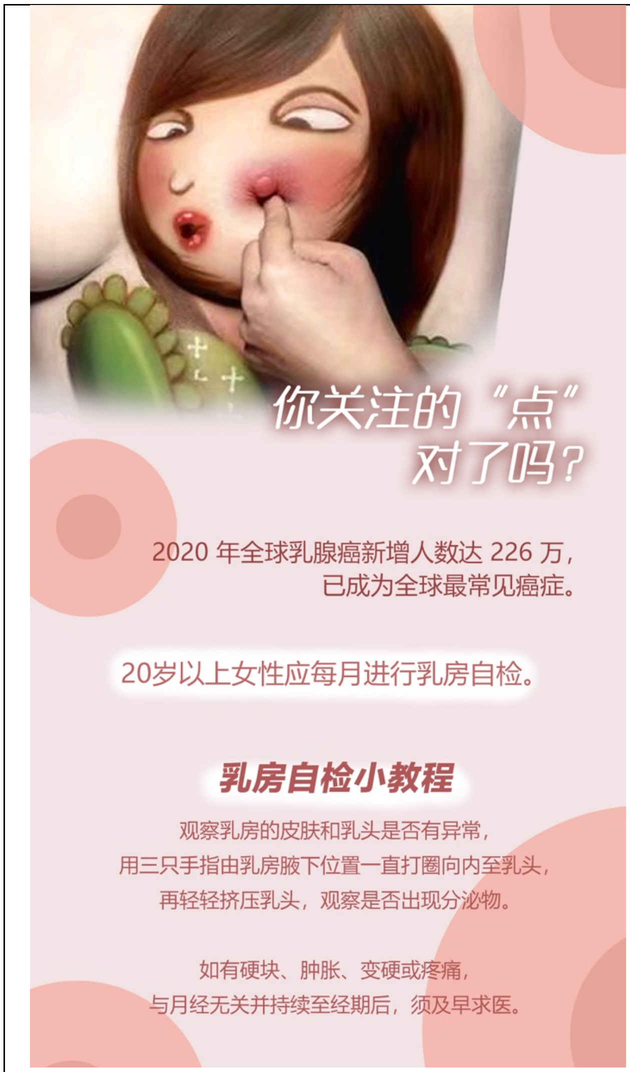
 预防乳腺癌 触摸自己 三 WOMEN BREAST CANCER. 2020 年全球乳腺癌新增人数达 226 万， 已成为全球最常见癌症。 **20岁上女性应每月进行乳房自检。** **1MIN 乳房自检小教程** 观察乳房的皮肤和乳头是否有异常， 用三只手指由乳房腋下位置一直打圈向内至乳头， 再轻轻挤压乳头，观察是否出现分泌物。 如有硬块、肿胀、变硬或疼痛， 与月经无关并持续至经期后，须及早求医。	**Condition 3: Low threat and high efficacy without humor** “Breast cancer has become a common cancer worldwide, thus, women over 20 years old should perform monthly breast self-examinations.” “1-minute breast self-examination tutorial: Observe the skin of the nipple and the nipple for abnormalities; use three fingers to circle from the position of the armpit of the breast all the way inward to the nipple, and then gently squeeze the nipple to observe if there is any discharge. Seek medical advice promptly if there is lumpiness, swelling, hardening, or pain that is not related to menstruation and persists until after your period.”

 你关注的“点”对了吗？ 2020 年全球乳腺癌新增人数达 226 万，已成为全球最常见癌症。 20岁以上女性应每月进行乳房自检。 1MIN 乳房自检小教程 观察乳房的皮肤和乳头是否有异常，用三只手指由乳房腋下位置一直打圈向内至乳头，再轻轻挤压乳头，观察是否出现分泌物。 如有硬块、肿胀、变硬或疼痛，与月经无关并持续至经期后，须及早求医。	**Condition 4: Low threat and high efficacy with humor** “Are you obsessed with the right ‘point’?” “Breast cancer has become a common cancer worldwide, thus, women over 20 years old should perform monthly breast self-examinations.” “1-minute breast self-examination tutorial: Observe the skin of the nipple and the nipple for abnormalities; use three fingers to circle from the position of the armpit of the breast all the way inward to the nipple, and then gently squeeze the nipple to observe if there is any discharge. Seek medical advice promptly if there is lumpiness, swelling, hardening, or pain that is not related to menstruation and persists until after your period.”

 预防乳腺癌 触摸自己 WOMEN BREAST CANCER. 世界卫生组织发布的全球最新癌症数据显示， 2020 年全球乳腺癌新增人数达 226 万， 已成为全球最常见癌症。 我国每年有 30 万女性确诊乳腺癌， **其中，20 岁至50 岁女性是高风险人群。** **专家建议，** **20岁以上女性应每月进行乳房自检。** **乳房自检小教程** 观察乳房的皮肤和乳头是否有异常， 用三只手指由乳房腋下位置一直打圈向内至乳头， 再轻轻挤压乳头，观察是否出现分泌物。 如有硬块、肿胀、变硬或疼痛， 与月经无关并持续至经期后，须及早求医。	**Condition 5: High threat and low efficacy without humor** “The latest global cancer data released by the World Health Organization shows that the number of new breast cancers worldwide in 2020 reached 2.26 million, which has become the most common cancer worldwide. In China, 300,000 women are diagnosed with breast cancer every year, and among them, women aged 20 to 50 are the high-risk group. Experts suggest that women over 20 years old should perform monthly breast self-examinations.” “Breast self-examination tutorial: Observe the skin of the nipple and the nipple for abnormalities; use three fingers to circle from the position of the armpit of the breast all the way inward to the nipple, and then gently squeeze the nipple to observe if there is any discharge. Seek medical advice promptly if there is lumpiness, swelling, hardening, or pain that is not related to menstruation and persists until after your period.”

 你关注的“点” 对了吗？ 世界卫生组织发布的全球最新癌症数据显示， 2020 年全球乳腺癌新增人数达 226 万， 已成为全球最常见癌症。 **我国每年有 30 万女性确诊乳腺癌，** **其中，20 岁至50 岁女性是高风险人群。** 专家建议，20岁以上女性应每月进行乳房自检。 **乳房自检小教程** 观察乳房的皮肤和乳头是否有异常， 用三只手指由乳房腋下位置一直打圈向内至乳头， 再轻轻挤压乳头，观察是否出现分泌物。 如有硬块、肿胀、变硬或疼痛， 与月经无关并持续至经期后，须及早求医。	**Condition 6: High threat and low efficacy with humor** “Are you obsessed with the right ‘point’?” “The latest global cancer data released by the World Health Organization shows that the number of new breast cancers worldwide in 2020 reached 2.26 million, which has become the most common cancer worldwide. In China, 300,000 women are diagnosed with breast cancer every year, and among them, women aged 20 to 50 are the high-risk group. Experts suggest that women over 20 years old should perform monthly breast self-examinations.” “Breast self-examination tutorial: Observe the skin of the nipple and the nipple for abnormalities; use three fingers to circle from the position of the armpit of the breast all the way inward to the nipple, and then gently squeeze the nipple to observe if there is any discharge. Seek medical advice promptly if there is lumpiness, swelling, hardening, or pain that is not related to menstruation and persists until after your period.”

 预防乳腺癌 触摸自己 WOMEN BREAST CANCER. 2020 年全球乳腺癌新增人数达 226 万， 已成为全球最常见癌症。 **20岁以上女性应每月进行乳房自检。** **乳房自检小教程** 观察乳房的皮肤和乳头是否有异常， 用三只手指由乳房腋下位置一直打圈向内至乳头， 再轻轻挤压乳头，观察是否出现分泌物。 如有硬块、肿胀、变硬或疼痛， 与月经无关并持续至经期后，须及早求医。	**Condition 7: Low threat and low efficacy with humor** "Breast cancer has become a common cancer worldwide, thus, women over 20 years old should perform monthly breast self-examinations." "Breast self-examination tutorial: Observe the skin of the nipple and the nipple for abnormalities; use three fingers to circle from the position of the armpit of the breast all the way inward to the nipple, and then gently squeeze the nipple to observe if there is any discharge. Seek medical advice promptly if there is lumpiness, swelling, hardening, or pain that is not related to menstruation and persists until after your period."

 你关注的“点”对了吗？ 2020 年全球乳腺癌新增人数达 226 万，已成为全球最常见癌症。 20岁以上女性应每月进行乳房自检。 乳房自检小教程 观察乳房的皮肤和乳头是否有异常，用三只手指由乳房腋下位置一直打圈向内至乳头，再轻轻挤压乳头，观察是否出现分泌物。 如有硬块、肿胀、变硬或疼痛，与月经无关并持续至经期后，须及早求医。	**Condition 8: Low threat and low efficacy with humor** “Are you obsessed with the right ‘point’?” “Breast cancer has become a common cancer worldwide, thus, women over 20 years old should perform monthly breast self-examinations.” “Breast self-examination tutorial: Observe the skin of the nipple and the nipple for abnormalities; use three fingers to circle from the position of the armpit of the breast all the way inward to the nipple, and then gently squeeze the nipple to observe if there is any discharge. Seek medical advice promptly if there is lumpiness, swelling, hardening, or pain that is not related to menstruation and persists until after your period.”