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## Communicating breast cancer risk information to young adult women: A pilot study

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### Abstract

**Objective**—To examine the effectiveness of a health promotion flyer to increase awareness of breast cancer risk and physical activity as a risk reduction strategy in young adult women.

**Methods**—Young adult women (N = 123) viewed one of five health promotion flyers online and then completed measures of perceived breast cancer risk (PR) and perceived informativeness (PI) and a qualitative thought-listing activity.

**Results**—Differences were observed in PI such that the control and low risk/low information messages were significantly less informative than the others. Qualitative analyses revealed two general themes: message content and flyer design. Additional analyses of the flyer design comments revealed four sub-themes: negative thoughts about the image, positive thoughts about the image, misunderstanding breast cancer risk information, and social comparison. Exploratory analyses controlling for message type indicated that image appraisal predicted PI such that those who commented on the image found the flyer to be less informative.

**Discussion**—Results suggest that the flyer was informative but did not impact young women's breast cancer risk perceptions. Additionally, the image may have distracted young women from the intended message. Evaluating the acceptability of images used in health promotion materials is recommended before testing the effectiveness of the intervention.

### Keywords

breast cancer; exercise/nutrition; health promotion; message design; risk perception

### Introduction

In 2015, there were approximately 232,000 women newly diagnosed with breast cancer in the US (American Cancer Society, 2015). The Centers for Disease Control and National Cancer Institute have recommended engagement in protective health behaviors (e.g., physical activity) at an early age to prevent cancer, including breast cancer. Research evidence suggests that regular physical activity (4 or more hours per week) can reduce future breast cancer risk by maintaining low body mass and fat levels and reducing insulin and

insulin-like growth factor 1 levels; thus, preventing tumor growth and improving immune response (National Cancer Institute, 2013). Past research has found a positive association between physical activity and reduced breast cancer risk (Bernstein, Henderson, Hanisch, Sullivan-Halley, & Ross, 1994; Gammon, John, & Britton, 1998; Kossman et al., 2011; Pronk et al., 2011; Thune, Brenn, Lund, & Gaard, 1997); however, there is wide variation in the reported risk reduction benefits. Risk reduction ranges from 20 to 80% (Lee & Oguma, 2006; McTiernan, 2006).

Young adult women are an understudied population in breast cancer research, who desire more specific breast cancer risk and risk reduction information (Simonian et al., 2004). Additionally, young adult women lack knowledge about breast cancer (Early, Armstrong, Burke, & Thompson, 2011) as well as the benefit of physical activity to reduce breast cancer risk (Bernat, Anderson, Parrish-Sprowl, & Sparks, 2015). Notably, young adult women are less likely to engage in physical activity than young adult men (Buckworth & Nigg, 2004), suggesting that they are an important group to target with physical activity interventions. There is also strong evidence that physically active young adults stay active throughout their lives (Calfas, Sallis, Lovato, & Campbell, 1994; Sparling & Snow, 2002); therefore, it is important to focus on motivating young women to be physically active for lifetime protective health benefits. Interventions are needed to educate young women about their risk for breast cancer and how they can reduce their risk for breast cancer in the future. Interventions are also needed to motivate young women to engage in protective health behaviors, including physical activity to reduce their risk of breast cancer.

Protection motivation theory (PMT) (Rippetoe & Rogers, 1987; Rogers, 1975) and the extended parallel process model (EPPM) (Witte, 1992, 1998) were developed to explain how individuals react to health promotion information containing threat appeals, including risk information. When faced with a health threat, individuals will appraise the threat and determine if the threat is severe and if they are personally at risk. Next, individuals will appraise the information about how to alleviate the threat and lower their risk level. According to these theories, health promotion materials will successfully motivate an individual to change his/her behavior, if the perceived risk (PR) is personally high and if there is enough credible information about how to alleviate their risk. Furthermore, the risk reduction information must be perceived as personally feasible (Floyd, Prentice-Dunn, & Rogers, 2000).

Building off concepts of PMT and EPPM, we developed a health promotion intervention to increase breast cancer risk awareness in young women. This was a pilot study to test intervention messages beforehand. Our messages aimed to increase awareness of breast cancer risk and young adult women's knowledge about engagement in physical activity to reduce their future risk. Consistent with the extant literature (Cameron & Chan, 2008; Houts, Doak, Doak, & Loscalzo, 2006), we chose to include an image (i.e., a woman running) as well as text to enhance the potential positive impact of the health promotion flyer. The present study piloted a health promotion flyer, testing the effectiveness of different messaging conditions on increasing young adult women's perceived breast cancer risk and knowledge of physical activity for risk reduction. We were interested in exploring different combinations of risk level and information level to determine the most effective messaging

condition. The primary outcomes were young adult women's perceived risk of breast cancer and perceived informativeness (PI) of the flyer. We hypothesized the following:

H1: Young women viewing the high-risk messages (i.e., high risk/high information and high risk/low information) will report higher levels of perceived risk than young women in the low-risk message conditions (i.e., low risk/high information, low risk/low information, and control).

H2: Young women viewing the high-information messages (i.e., high risk/high information and low risk/high information) will report higher levels of perceived informativeness than young women in low-information message conditions (i.e., high risk/low information, low risk/low information, and control).

Qualitative thought-listing data were also collected to further examine young women's perceptions of the health promotion flyer and to assess for acceptability of both the message text and the accompanying image. Ultimately, we planned to use the open-ended data to guide refinement of the intervention messages for use in future trials. As such, we posed the following qualitative research question:

RQ1: What were young women's perceptions of the health promotion flyer?

## Methods

### Participants

The current sample consisted of premenopausal women ( $N = 123$ ) from the community. On average, women were 21 years old (range: 19–39 years). No other demographic data were collected.

### Measures

**Thought listing**—To capture qualitative data on the participants' appraisals of the health promotion flyer, participants were asked to list any thoughts negative, positive, and/or neutral they had about themselves, the situation, and/or others. The participants recorded their answers after viewing the flyer in a textbox provided (Cacioppo, von Hippel, & Ernst, 1997).

**Perceived breast cancer risk**—To determine perceived risk of breast cancer, measures of absolute (one item) and relative risk (one item) were used (Hartman, Dunsiger, & Marcus, 2011). Absolute risk (seven-point scale, ranging from *very unlikely* to *very likely*) captured a woman's perception of her total lifetime risk of developing breast cancer. Relative risk (seven-point scale, ranging from *very low* to *very high*) captured a woman's perception of her absolute risk compared to other women's absolute risk. Perceived risk was calculated as a sum of these two numbers (Hartman et al., 2011). The Perceived Breast Cancer Risk scale has been adapted from past research by Brain, Norman, Gray, and Mansel (1999) and Rowe, Montgomery, Duberstein, and Bovbjerg (2005), and the measure has demonstrated acceptable internal consistency ( $\alpha = 0.75$ ) and validity in the past (Hartman et al., 2011). Internal consistency for this scale was acceptable in the present study ( $\alpha = 0.90$ ).

**Perceived informativeness**—To determine women’s perceptions of the informativeness of the health promotion flyer, participants completed four items (seven-point scale, ranging from *strongly disagree* to *strongly agree*) related to informativeness (Williams-Piehotka et al., 2009). These items were developed for this study based on Williams-Piehotka et al.’s (2009) research on message tailoring using monitoring/blunting coping styles (Miller, 1987). An example item is: “The flyer provided detailed information about breast cancer risk.” Perceived informativeness was calculated as a total score of all four items. Internal consistency for this scale was acceptable in the present study ( $\alpha = 0.87$ ).

**Procedure**—The university’s human subjects Institutional Review Board approved this study. Participants were solicited through social media using a snowball sampling approach, where the women could invite their friends to complete the survey. We included all premenopausal women who were able to read and respond in English. We did not assess for a history of breast cancer or actual breast cancer risk. Participants completed an online informed consent form and were randomized to view one of five health promotion flyers, where message type varied by risk level and amount of information presented. Message conditions included: (1) high-risk message with high amount of information, (2) high-risk message with low amount of information, (3) low-risk message with high amount of information, (4) low-risk message with low amount of information, and (5) control message (“Exercise can help you maintain a healthy weight and overall lifestyle.”). All flyers depicted the same image (i.e., a woman running) that was obtained from an online bank of stock images. After viewing the flyer, women completed the relevant study measures online.

## Results

### Primary analyses

Overall, the sample had a moderate concern with risk of developing breast cancer ( $M = 3.78$ ,  $SD = 1.25$ ) and believed the flyer was moderately informative ( $M = 3.78$ ,  $SD = 1.59$ ). One-way ANOVAs were conducted to examine differences in PR and PI across message conditions. No differences were observed in PR by message type ( $p > 0.05$ ). Differences in PI were found between the message types ( $F(4,122) = 22.188$ ,  $p < 0.001$ ) such that the control message was significantly less informative than both high-risk messages and the low-risk/high-information message ( $p < 0.001$ ). The low-risk/low-information message was less informative than both high-risk messages ( $p < 0.001$ ) and the low-risk/high-information message ( $p = 0.048$ ). The low-risk/low-information and control messages did not differ significantly (Figure 1).

To further understand individuals’ perceptions of the flyer, the open-ended thought-listing responses were examined using an iterative analysis strategy. First, a conventional content analysis method, focusing on the contextual meaning of the text was conducted (Hsieh & Shannon, 2005). The coder read through the responses with a goal of broadly describing the phenomenon with no preconceived ideas of categories/themes that may emerge from the data (Glaser & Strauss, 1967). The information provided by the participants seemed to fit into two general categories: comments about message content and comments about the flyer design/image (Table 1).

Overall, the comments about the message content suggested that young women received the intended risk awareness and physical activity promotion messages. The striking data that emerged were the negative comments about the picture. Initial review of the flyer design comments suggested that young women were focused on the stock image of the woman running. As such, we conducted further qualitative analyses to examine these comments in more detail to inform refinement of future flyer design. Two independent coders filtered the participant reactions to include only those that specifically mentioned the image. Nearly half the sample (40%) appraised the image on the flyer in the thought-listing task. Second, two coders rated the statements as containing positive, negative, or neutral opinions. During message filtering and valence coding, 100% agreement was established. Of those who did appraise the image, 66.7% of the statements contained a negative opinion of the activity or the woman in the picture (Table 1). Additionally, comments communicated breast cancer risk misperceptions and social comparison, most of which were tied to negative emotions (Table 1).

### Exploratory analyses

Due to the frequency of negative comments about the image, we sought to explore the impact of the image appraisal on study outcomes. Chi-square analyses were conducted to examine the impact of message type on image appraisal. Results suggest that there were significant differences by message condition ( $\chi^2 = 9.53, p = 0.049$ ) such that participants who received a high-risk/low-information message were less likely than expected to appraise the image ( $z = -1.9, p = 0.057$ ). Differences in outcomes (i.e., PI and PR) were examined by image appraisal groups (yes/no) to determine if negative perceptions of the image impacted outcomes. After controlling for message type, ANCOVA revealed a trend for PI ( $F = 2.473, p = 0.089$ ) with image appraisal emerging as a significant predictor of PI ( $F = 4.930, p = 0.028$ ) such that those who discussed the image found the flyer to be less informative. There were no differences between the image appraisal groups on PR after controlling for message type ( $p > 0.05$ ).

### Discussion

The goal of the present pilot study was to test the effectiveness of different messaging conditions on a health promotion flyer on increasing young adult women's perceived risk of breast cancer and knowledge of physical activity for breast cancer risk reduction. Contrary to hypotheses, perceived risk of breast cancer did not differ by message condition. Data suggest that the participants perceived moderate risk, regardless of the message they received. The high-risk message had good face validity, directly stating that the young woman was at risk; however, this statement does not appear to have been compelling enough to change their perceptions of their own risk. Perceived informativeness did differ by message condition as expected. Specifically, the young women in the low-risk/low-information group rated the flyer as significantly less informative than those in the other message conditions, suggesting that the young women who received more information perceived the messages to be more informative.

Qualitative data from the thought-listing activity suggested that our messages were not acceptable for some of the young women. The comments regarding the message content supported our hypotheses and suggested that the flyers, indeed, communicated information about breast cancer risk and physical activity as a risk reduction strategy. The thought-listing activity also revealed both positive and negative thoughts related to the overall flyer design (e.g., color) as well as the image of the woman running. We extracted additional themes about misunderstanding breast cancer risk information and social comparison. Our data support past research that suggests there is a lack of knowledge and overall misunderstanding of breast cancer risk (Bernat et al., 2015; Simonian et al., 2004); thus, these women would benefit from additional education. The comments about the young women comparing their bodies to the woman in the picture and resulting negative emotions, suggest that using images without pilot testing may have unintended and possibly harmful consequences for this population.

Exploratory analyses examined the impact of image appraisal on our outcomes. After controlling for the type of message viewed, image appraisal was a significant predictor of PI, suggesting that despite the type of message they were presented with, young women who commented on the image perceived the message to be less informative. It is possible that these young women were distracted by the image, and it detracted from the intended message. Though speculative, the unintended effect of the image may have prevented them from central processing of the message (Lee, Cameron, Wünsche, & Stevens, 2011; Williams & Cameron, 2009).

This study supports the need to examine the impact of images, in addition to text, on communication of health promotion messages. Cameron and Chan (2008) and Witte (1992) suggest that images have the potential to increase the impact of a threat appeal message. Even though research has suggested that the use of pictorial messaging (i.e., with both text and an image) is more effective than text-only messaging, there is an overall lack of research on the specific mechanisms involved in image processing (Cameron & Chan, 2008; Lee et al., 2011). Accordingly, Williams and Cameron (2009) caution message developers of including images without empirical evidence. Similarly, Houts et al. (2006) recommended that practitioners pilot pictorial messages with the target audience to prevent unintended effects.

This study should be viewed in light of several limitations. First, due to the sampling technique, the sample may not be generalizable to all young women. Using social media is an efficient way of recruiting participants (Fenner et al., 2012); however, we realize that combined with snowball sampling, we may have recruited participants who may have both geographic and attitudinal similarities. Second, we did not collect information on the young women's baseline physical activity, their exact weights, or their family history of breast cancer, all of which may impact their actual breast cancer risk, as well as their perceptions of their breast cancer risk, of engaging in physical activity, and of the health promotion flyer. Third, the study design was cross-sectional and descriptive, which precludes drawing causal conclusions regarding the impact of the message viewed on young women's breast cancer risk perceptions and perceived informativeness of the flyer. To address these limitations, future studies should utilize more systematic sampling procedures to recruit a more diverse

sample and collect additional demographic and health information from participants. In addition, longitudinal, randomized clinical trials of the health promotion flyers should be conducted to test the impact of the intervention on breast cancer risk perceptions and actual engagement in physical activity. According to PMT and EPPM, perceived risk must be personally high for individuals to pay attention to health promotion messages (Floyd et al., 2000; Witte, 1998); thus, future studies should also consider tailoring breast cancer risk information to young women's actual breast cancer risk factors (e.g., family history, weight) or targeting populations of young women, who are at greater risk of developing breast cancer.

## Conclusion

The design of health promotion materials can cause unintended effects. Our results demonstrate the importance of evaluating the acceptability of all health promotion materials before testing the effectiveness of the intervention. To facilitate this process, it is recommended that health communication experts be included on interdisciplinary health promotion teams to optimize message design strategies. In future research, our health promotion flyer will be revised with a different image to enhance the intended message to facilitate central processing of risk information (Williams & Cameron, 2009). Future research should continue to explore the impact of both message content and images in health promotion materials to determine the most effective combinations of message features to increase adherence to message recommendations.

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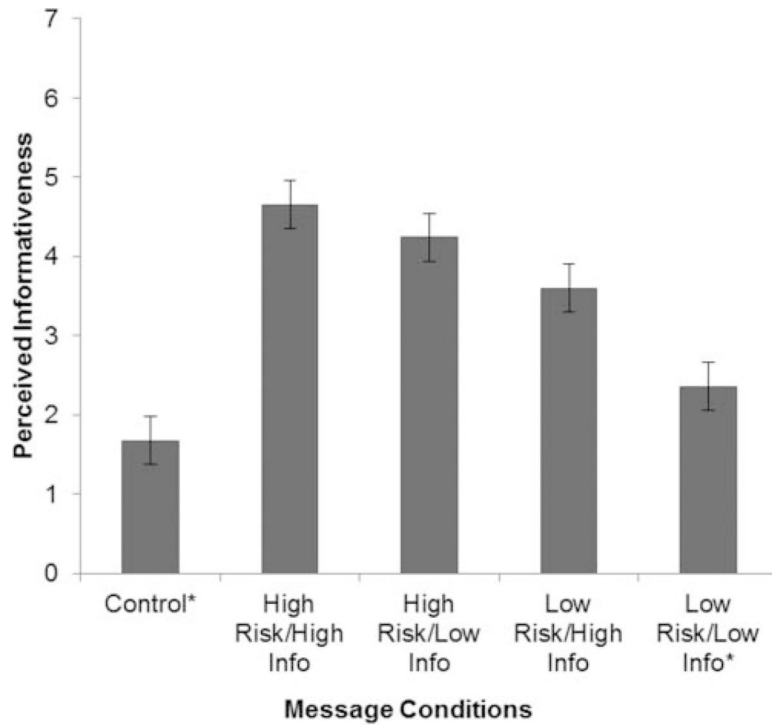
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**Figure 1.** Control and low-risk/low-information message significantly different than other message conditions ( $p < 0.05$ ).

**Table 1.**

Themes extracted from young adult women's thought-listing data.

| Theme                                | Examples  |
|--------------------------------------|---|
| I. Message content                   | <p>"It is clear that prevention is what the flyer is promoting and that physical exercise can reduce one's risk for breast cancer. Therefore, as a reader, I got the message that to prevent breast cancer I should exercise, although type of exercise and what is considered exercise was not clear."</p> <p>"I think it sends a message for people to be aware of the susceptibility of breast cancer and the importance of staying active. My mother had breast cancer so I already know my personal risk and am very cautious about the matter."</p> |
| II. Message design                   |   |
| A. Flyer design                      | <p>"The background picture really set the mood. The bold print also helped the main points stand out."</p> <p>"I looked at the pink ribbon at the bottom, wondered why it was fairly low quality and didn't look "real" (compared to the ribbons I had seen before in other publications, etc.)"</p>  |
| B. Image                             |   |
| 1. Positive                          | <p>"I did really like the picture of the girl exercising, since she seemed to be genuinely enjoying herself. So that made me think about exercise in a positive light."</p> <p>"The runner is a nice design choice."</p>  |
| 2. Negative                          | <p>"The girl in the picture appears very young to me. I didn't identify with her, because she look like she's 16 and she appears to be significantly below normal in terms of her weight."</p> <p>"I thought that the woman depicted in the picture was unrealistically fit and thin."</p>  |
| 3. Breast cancer risk misperceptions | <p>"The girl in the picture looks too young to have to worry about breast cancer."</p> <p>"The person in the picture looked skinnier than the "average" woman and I felt her breast size was smaller than what I would consider at "high risk" for developing breast cancer."</p>   |
| 4. Social comparison                 | <p>"The first thing I saw was the picture of the woman and I immediately became jealous of how she looked when compared to myself."</p> <p>"My first thought was that I wish my waist looked like the woman in the picture. Then I started reading the information and started to think about how much physical activity I perform within the week. Thinking about all of that made me feel somewhat sad and upset because if I were to spend more time being physically active I could look like the woman in the picture."</p>                          |