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MEDIA & COMMUNICATION STUDIES | RESEARCH ARTICLE

Breast cancer survivor testimonies: Effects of narrative and emotional valence on affect and cognition

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Abstract: This study examined the impact of narrative and emotion on processing of African American breast cancer survivor messages. We employed a two (narrative: present/absent) × three (emotional valence: pleasant/unpleasant/mixed) × four (message repetition) within-subjects experimental design. Findings indicated narrative messages with both pleasant and unpleasant emotional content (mixed) showed the greatest attention (heart rate deceleration) and negative emotional response (corrugator supercillii) while unpleasant narratives showed the least. Surprisingly, non-narrative messages showed the opposite pattern of results, where unpleasant messages showed the greatest attention and emotional response while non-narrative messages with mixed emotional content showed the least. These data initially point to the conclusion that attention for narrative material depends on the valence of emotion expressed in the message, which has both theoretical and practical implications.

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PUBLIC INTEREST STATEMENT

Personal stories, or narratives, are often used in health media messages in order to encourage attention and emotional responses to these messages. Many researchers consider narrative messages to be the most effective at conveying important information and at persuading audiences. This study examined the impact of African American breast cancer survivors' personal stories of dealing with the disease and the emotional tones of their stories on how African American women who watched these stories paid attention and emotionally responded to them. Findings indicate that narrative messages with both pleasant and unpleasant emotional content showed the greatest attention and negative emotional response, while unpleasant narratives showed the least. Surprisingly, non-narrative messages showed the opposite pattern of results, where unpleasant messages showed the greatest attention and emotional response while non-narrative messages with mixed emotional content showed the least. These data initially point to the conclusion that attention for narrative material depends on the valence of emotion expressed in the message, which has both theoretical and practical implications.

Subjects: Mass Communication; Risk Communication; Health Communication

Key words: breast cancer; cognitive processing; emotion; narrative; African American

1. Introduction

Narrative health message strategies have been explored increasingly as ways to improve health (e.g. Bollinger & Kreuter, 2012; Eddens et al., 2009; Gunaratnam & Oliviere, 2009). Research has indicated a number of positive effects for narrative messages, including stronger emotional response, greater cognitive engagement, and reduced counterarguing (Green, 2006; Hinyard & Kreuter, 2007; Kreuter et al., 2007). Social science researchers continue to explore how narratives can increase understanding, model desirable behaviors, and serve as an effective message strategy for health promotion campaigns dealing with highly emotional topics. This is particularly important in cultures that have a history of storytelling and concomitantly suffer significant health outcome disparities, such as in the African American community. This study explores the efficacy of narratives told by African American survivors of breast cancer about their breast cancer experiences on cognitive and emotional responses of African American women viewers. Our experiment specifically tested how emotional content (pleasant, unpleasant, and co-active/mixed) interacts with a narrative presentation in driving how viewers mentally process and respond to messages from breast cancer survivors. We employ psychophysiological measures in order to record variation in cognitive and emotional processes engaged when individuals are exposed to and process media content. These measures index embodied motivated processes related to attention and emotion that are engaged through media exposure and that are distinct from concepts related to mental processes that have been measured through self-report (Potter & Bolls, 2012). The inclusion of psychophysiological measures in this study advances theoretical understanding of responses to health narrative content by examining embodied motivated processes engaged by narrative content as called for by Sukalla, Bilandzic, Bolls, and Busselle (2015) and exploring how varying emotional tone of the message impacts responses. This study contributes theoretical insight into narrative content in the socially important health context of breast cancer prevention and treatment within the African American community, where significant disparities exist in health outcomes related to this terrible disease.

A diagnosis of breast cancer may entail a markedly different outcome for an African-American woman compared to her Caucasian counterpart. Although Caucasian women are more likely to have breast cancer, African-American women are more likely to die from the disease. According to the American Cancer Society (2012), breast cancer is the second leading cause of cancer death in women. African-American women have the highest breast cancer mortality rate among all racial groups, despite having a lower incidence rate than Caucasian women when all ages are considered (American Cancer Society, 2012; Menashe, Anderson, Jatoi, & Rosenberg, 2009). The significant difference in breast cancer death rates between these two racial groups has increased over the last two decades (U.S. Cancer Statistics Working Group, 2017).

This disparity exists despite reports that the level of breast cancer screening is equal between the two groups (National Cancer Institute, 2005; U.S. Cancer Statistics Working Group, 2017). National data indicate that breast cancer incidence decreased 2.2% per year among all women from 1999–2005, compared to a 0.6% decrease per year among African-American women only (Jemal et al., 2008). When considering only women under age 40, African-American women have the highest breast cancer incidence rate of all racial or ethnic groups (Brinton, Sherman, Carreon, & Anderson, 2008).

This study builds upon and extends narrative research from the *Living Proof* breast cancer survivor stories project (McQueen & Kreuter, 2010; McQueen, Kreuter, Kalesan, & Alcaraz, 2011; Yoo, Kreuter, Lai, & Fu, 2014). Supported by an NCI Center for Cancer in Excellence Communication Research, project staff interviewed and professionally recorded the personal testimonials of 49 African-American women who were breast cancer survivors and/or family members of survivors. The current study is based on that database of interviews, which focuses on message features in segments from

more than 50 h of interview footage that were collected by project researchers. Based on a targeted selection and pretest, we identified a series of video testimonial clips that were used in this study. Specifically, we identified clips in which breast cancer survivors discuss their experience either in a narrative format or not, as well as the emotional tone expressed in the testimonial. Using these clips, we conducted an experiment with a sample of African-American women to assess which kinds of communication patterns among narrative and emotional structures generated attention, emotional response, transportation, and information seeking behavior.

To assess viewer responses, we examined self-report data as well as the results of two physiological measures—heart rate and corrugator supercillii. Physiological measures allow researchers to observe how cognitive/emotional responses unfold over time, while participants are viewing audio/visual messages. Combining the physiological measures with self-reports allows us to gain a more comprehensive view of the impact of emotional narratives, ultimately leading to practical insights to guide the production of more effective campaign messages.

Our testing of these interview clips is driven by an underlying goal of better understanding the impact of cancer survivor testimonials on immediate cognitive, affective, and behavioral influences on viewers. Prior research has shown that messages incorporating testimonials from breast cancer survivors are effective at changing attitudes toward breast cancer prevention (Frisby, 2006). Among African-American women in particular, breast cancer messages that include survivor testimonials foster greater intentions to get a mammogram and higher perceived importance of the practice.

Grounded in the limited capacity model of motivated mediated message processing (LC4MP, Lang, 2006), this study examines how emotional content and narratives interact on how individuals process breast cancer testimonials. In the following sections, we first review literature on the LC4MP, then pivot to the influence of narrative structure on how individuals process media content.

2. Literature review

Lang's (LC4MP) proposes that humans have limited cognitive resources to allocate to mental tasks while processing media messages. Under this model, media content is conceptualized as a stream of information consisting of motivationally relevant stimuli that evokes varying patterns of motivational activation which in turn influences cognitive and emotional processing.

The motivational activation model, which Lang incorporated into the LC4MP, conceptualizes emotional valence as a dual system, consisting of underlying motivational systems – the appetitive (approach) and aversive (avoid) systems – that continuously drive cognitive and emotional processing depending on the motivational significance of external stimuli (approach/avoid) and perceived consequences of information encountered in one's environment (Bradley, 2000). Activation within the appetitive and aversive systems can be reciprocal, resulting in high activation in one system and low in the other, co-active, when activation is high both systems, inactive, when activation is low in both systems, or disassociated, such that changes in one system do not affect the other system (Cacioppo, Gardner, & Berntson, 1999). These patterns of motivational activation within the appetitive and aversive emotional systems engage unique cognitive and emotional responses involved in processing and adaptively responding to stimuli in an individual's environment (Cacioppo & Berntson, 1994).

The expression of emotion in stories told by cancer survivors is likely to be a motivationally relevant message cue and thus have significant effects on cognitive and emotional responses in viewers of those stories. In the current study, we are interested in how activation of these motivational subsystems through aligned emotional tone of the message and narrative style impacts viewers' cognitive and emotional responses to breast cancer messages. Consequently, we conceptualized our emotional message categories within the spirit of these two motivational systems. We examined pleasant message content (content that should activate the appetitive system), unpleasant message content (content that should activate the aversive system), and mixed emotion message content (content that should activate both appetitive and aversive systems). When both

motivational systems become activated due to co-active messages (messages that have mixed emotional content; or both pleasant and unpleasant content), cognitive resources should be allocated at higher levels. Indeed, Lang, Sanders-Jackson, Wang, and Rubenking (2013) found that co-active messages resulted in more resources allocated to message processing and better encoding than either unpleasant or pleasant messages.

2.1. Processing of narrative messages

Narrative messages may have a distinct advantage in promoting attention to and adoption of health-related recommendations. Narrative structure has been studied across many media and has been shown to have a significant impact on human cognition and affect (Green, Brock, & Kaufman, 2004; Schneider, Lang, Shin, & Bradley, 2004). While definitions of narrative vary, virtually all center on a temporal sequence of connected events (Labov, 1972; Prince, 1982). The hallmark of the narrated story is a series of utterances representing the past as a sequence of events, recounted in the same or in a similar order as the original events (Labov & Waletzky, 1967; Sarbin, 1986). It is generally agreed that the prototype for narrative is interpersonal storytelling.

Narrative thinking is a familiar, comfortable occurrence that humans engage in from their earliest social encounters (Kreuter et al., 2007). Not only is narrative fundamental to human communication (Farrell, 1985; Fisher, 1985; Lang, Sias, Chantrill, & Burek, 1995), but narrative thinking is also a heuristic process (Robinson & Hawpe, 1986). Research shows that people automatically construct a storyline to link pieces of information (Sarbin, 1986), and individuals tend to recall even non-narrative messages in narrative form (Lang, Sias, et al., 1995).

Other scholars conceptualize narratives as scripts and scenes (Schank, 1982; Schank & Abelson, 1977) or mental models (Busselle & Bilandzic, 2008). These mental constructions fuse a person's pre-existing knowledge with information contained in the narrative text (Busselle & Bilandzic, 2009). The ongoing, cumulative process of mental exertion presents unique challenges for shorter narratives, such as PSAs or the testimonial clips used in this study, due to limited time for schema construction and engagement with the story. Slater and Rouner (2002) described PSAs as "perhaps the most minimal narratives that can be reasonably presented" (p. 182).

Scholars generally agree that narrative enhances persuasive impact because it elicits cognitive and affective investment in the message, a phenomenon labeled engagement with the message (Slater & Rouner, 2002), absorption (Graesser, 1981), or transportation (Gerrig, 1993; Green & Brock, 2000). The transportation theory of narrative persuasion (Green, 2006; Green & Brock, 2000) proposes that this phenomenon comprises dimensions of imagery, affect, and attention, and that absorption into the narrative is necessary for persuasive impact. Busselle and Bilandzic (2008) conclude that attentional focus is a key component of narrative engagement.

The importance of narrative elements has been established in media research (Green, 2006; Kreuter et al., 2007; Selnow, 1984). Stories have been shown to make a television program more interesting, more memorable and more compelling (Kaplan, 1981), and engagement with narratives is strongly associated with enjoyment of the content (Bilandzic & Busselle, 2006; Green et al., 2004). Television messages presented in a narrative format have been shown to be easier to process and remember (Graesser, 1981; Lang, 1989; Lang, Sias, et al., 1995; Thorson, 1989). Similar findings have been shown for narrative advertising (Shin, Lee, & Lee, 2003). Narratives may be particularly effective for cancer communication due to their potential to facilitate information processing, attenuate counterarguing and resistance, stimulate vicarious experience with unfamiliar situations (e.g. getting a mammogram), and elicit strong reactions from audiences (Green, 2006; Kreuter et al., 2007; Oliver, Dillard, Bae, & Tamul, 2012).

Non-narrative messages, which include didactic/advice-giving, statistical, conversational or expository formats, have been studied primarily in contrast to narrative elements (e.g. McQueen et al., 2011). As outlined above, these studies generally conclude specific advantages for narratives, but

there is some indication of ways that non-narrative messages may outperform their narrative counterparts. For example, research comparing narrative and statistical evidence in persuasion suggests that statistical messages are perceived as more informational, although narratives are perceived as more realistic (Greene & Brinn, 2003). McQueen et al. (2011) compared narrative testimonials to informational messages about breast cancer and found that narrative message was positively associated with transportation, identification, and emotional response. Theoretically, non-narrative structure that tends to be less emotional is more likely to feature content that is less motivationally relevant in terms of the LC4MP model, and thus, may activate the appetitive and aversive motivational systems to a lesser extent. Teasing apart nuances in how the motivational relevance of narrative and non-narrative message content impacts attention and emotion reflected in embodied motivated processing of messages is an existing theoretical gap in research on the effectiveness of health narratives in health persuasion. Clarifying the relative advantages of narrative and non-narrative message content in prompting cancer prevention practices among African-American women may be particularly important for this at-risk population.

This study aims to extend our present understanding of emotional narratives in media messages by examining narrative and non-narrative structures in testimonials from breast cancer survivors across varying levels of emotional expressiveness and testing their impact on viewers' immediate cognitive and emotional responses. Although the literature indicates potentially powerful effects for narrative messages, we argue that greater nuance regarding *how* narratives operate on cognitive and emotional processes could more precisely inform message design.

Considering the previously observed influence of narrative structure and emotional valence, the potential effects of this interaction suggested by research on motivated processing, and explorations of emotional expressiveness in breast cancer survivor testimonials, suggests that both narrative and mixed emotional messages should increase mental resources allocated to the message and transportation. Narrative structure and unpleasant content should increase negative emotional response. Thus, we predict the following three interactions:

H1: Narrative structure with mixed emotional content will increase resource allocation compared to the other emotional content or to the non-narrative structure.

H2: Narrative structure with unpleasant content will increase negative emotional response compared to other emotional content or to non-narrative structure.

H3: Narrative structure with mixed emotional content will increase transportation compared to positive content or to non-narrative structure.

Although research on the impact of narrative on subsequent information seeking about the issue is lacking, there is some research on the role of emotion and affect on information seeking. It should be noted that these theories operationalize emotion as self-report appraisals, and not direct, psychophysiological measures of valence and arousal. This is an important theoretical difference between this study and previous research considering that self-report measures are proposed to measure the conscious perception of experienced emotion while psychophysiological measures index the actual embodied experience of emotional responses (Potter & Bolls, 2012). This difference means that results obtained through these different measures may or may not be correlated or consistent. Testing the risk perception attitude framework, Turner, Rimal, Morrison, and Kim (2006, Study 2) found that the high risk participants reported higher fear (Turner et al. labeled it "anxiety") and higher information seeking intentions than the low risk participants. So (2013), in presenting an extension of the extended parallel process model (EPPM, Witte, 1994) theorized that fear and anxiety indirectly lead to information seeking through perceived efficacy and threat, coping appraisals, and coping styles. In a test of the theory of motivated information management, Afifi and Weiner found that anxiety, indirectly and negatively impacted seeking information directly from a partner about sexual health. The approaches represented by these works conceptualize emotion as discrete emotional states (e.g. fear, anxiety)

that emerge from individuals' cognitive appraisal of their environments. The dimensional approach adopted in the current study considers emotion as a relatively short-lived affectively-valenced response emerging from basic motivational activation (i.e. appetitive and aversive motivational systems) to environmental stimuli (Bolls, 2010; Nabi, 2010). Because of these disparities, we ask the following:

RQ1: How do narrative structure and emotional content impact information seeking intentions?

We also measured self-reported arousal as a control for message valence, because negative content can activate the aversive motivational system at a faster rate than positive content would activate the appetitive motivational system. We wanted to ensure that arousal did not covary along with emotional content.

3. Method

This study employed a 2×3 within-subjects experimental design, manipulating narrative structure (present/absent), and emotional valence (pleasant/unpleasant/mixed) in audiovisual messages from breast cancer survivors. The design also included a message replication factor, where each level of treatment (6) was represented by four messages. Hence, each participant saw 24 messages and participants were randomly assigned to one of four message presentation orders. The dependent measures were attention, negative emotional response, transportation, and information seeking, and self-report arousal.

3.1. Participants

Participants were African-American women, age 40 or older, none of whom had been diagnosed with breast cancer. A total of 46 women participated in this study. Participants were recruited through several guerrilla-marketing techniques. Recruiting fliers were distributed to local businesses, community centers, churches, and personal contacts. Study personnel discussed the study with personal acquaintances and solicited local business, religious, and community leaders to help distribute fliers. Participants were paid \$50 for their participation and given information packets about breast cancer that we obtained from a local cancer hospital after completion of the study.

3.2. Dependent variables

Dependent variables included attention and emotional response, transportation, and self-reported likelihood of engaging in breast cancer information seeking behavior.

3.2.1. Attention

Attention was conceptualized as cognitive resources allocated to a message. Greater resource allocation to an external stimulus results in slower heart rate (Lang, 1994). Research team members measured attention by obtaining participants' heart rate for a five second baseline period prior to each message and then during exposure to each message. Heart rate measurement involved placing three standard AG/AGCL electrodes on participants' forearms for purposes of data collection. Heart rate was collected during the entire message as milliseconds between R spikes in the cardiac cycle and converted to beats per minute (BPM) for each second of data collection. Beat per minute change was calculated for each second of exposure as the difference between the BPM at a given time point and the last baseline BPM collected.

3.2.2. Negative emotional response

Negative emotional response was conceptualized as activation of the aversive motivational system and was operationalized through corrugator supercillii facial EMG (Schneider et al., 2004; Tassinari & Cacioppo, 1992; Vrana, 1993). Corrugator supercillii activation has been shown to be a reliable indicator of negative emotional response (Potter & Bolls, 2012). Negative emotional response was measured by placing two AG/AGCL electrodes over the corrugator muscle located along a participant's brow. The EMG signal was amplified and filtered using 90 Hz high pass and 1000 Hz low pass filters. Facial EMG was sampled 20 times per second and averaged over each second of data collection.

3.2.3. Transportation

Transportation was measured with a reduced 5-item index adapted from Green and Brock (2000): (1) While I was watching this video clip, I could easily picture the events described taking place, (2) I could picture myself in the scene described in this video clip, (3) I was mentally involved in this video clip while viewing it, (4) I found my mind wandering away from this video clip while I was viewing it (reverse code), (5) I wanted to learn how the woman's story presented in this video clip turned out (9-point scale; anchors: strongly agree/strongly disagree). The Green and Brock (2000) concept of transportation is defined as "absorption into the story" and entails imagery, affect, and attention. Their index included 15 items, and they reported moderate reliability ($\alpha = 0.76$). Because our procedure would not make answering 15 items after each of the 24 messages plausible, we decided to adopt a reduced index that would essentially measure cognitive engagement. However, reliability analysis showed that an index comprised of these five items above was unreliable ($\alpha < 0.50$). A principal components analysis was conducted, the results of which showed that only three of the items could be combined to create a (marginally) reliable index ($\alpha = 0.69$): I could easily picture the events described taking place; I could picture myself in the scene described in this video clip; I was mentally involved in this video clip while viewing it. Therefore, an averaged index of these three items was computed to represent transportation. Factor analysis using principal axis factoring confirmed that these three measures loaded onto a single factor (eigenvalue = 1.53, 51.00% variance explained).

3.2.4. Information seeking intention

Information seeking intention was measured with a single item: Based on information you viewed in this video clip, how likely are you to seek out additional information about breast cancer? (9-point scale; anchors: not at all/very much).

Arousal was also measured to control for its potential confounding effects on attention. Arousal was measured with a single item: How calm or excited did viewing this clip make you feel? (9-point scale; anchors: very calm/very excited).

3.3. Stimulus selection and independent variables

Message selection and manipulation are key factors in developing instances of theoretical categories for experimental testing. In order to create message variance within levels of treatments, multiple messages were selected to represent a level of each independent variable in all six possible treatment combinations. Designating multiple messages per treatment level (as opposed to a single message) is a strategy to create systematic treatment variance that recognizes that messages vary along many dimensions, in addition to the ones in which we are interested (see Reeves & Geiger, 1994; Thorson, Wicks, & Leshner, 2012). Each participant watched four messages per treatment level, or 24 total messages.

Video clips used as stimulus messages were collected as part of the *Living Proof* study (McQueen et al., 2011); researchers interviewed 49 African-American breast cancer survivors and/or family members of survivors about their experiences. Possible messages were identified through prior coding (Kreuter et al., 2008).

We identified 60 possible messages for use, including 10 for each treatment level. We then pretested the messages with a group of undergraduate students ($N = 22$) who were not familiar with the study. Pretest judges rated each message in terms of narrative structure and emotional valence (positive and negative separately). This pretest was conducted to verify prior coding and to gather data for statistical comparisons to ensure proper message categorization. Pretest results are presented following the operational descriptions of our independent variables, narrative structure and emotional valence.

Narrative was defined as the recounting of events in sequence. Specifically, pretest judges were instructed to rate each clip according to the following: A narrative is defined as having both of the following criteria: (a) events and characters are connected, and (b) there is an identifiable structure

or time sequence that is bounded by space and time (Banks-Wallace, 2002). For example, if a person is recounting an event (e.g. diagnosis, chemotherapy, talking with others) in temporal order (generally, in the order the event occurred in time), and if the recounting involved at least one person (self, doctor, family member, etc.), then the clip should be coded as a narrative. Coders scored each clip based on the following question: To what extent do you think this clip is a narrative? (7-point scale, anchors: not at all/a lot).

Non-narrative was defined as interview discourse that lacked a recounting sequence of events or clips that scored low on the narrative scale above. Essentially, most of the non-narrative material took the form of advisement to other women, focusing particularly on the response efficacy of cancer detection practices such as mammograms. All video clips were single camera interviews of individual women, shot in medium close-up, with no cuts, edits, or camera movement (Median = 51 s).

Messages that represented the highest and lowest narrative ratings were chosen as experimental stimuli. The difference between messages designated as narrative and non-narrative was highly significant ($t(22) = 14.051, p < 0.001$) and in the predicted direction ($M_{\text{narrative}} = 6.02, M_{\text{non-narrative}} = 1.83$). See Table 1 for a complete list of pretest ratings.

Emotional valence manipulations were also determined through pretest ratings. Coders scored each clip separately on the emotional expressiveness the interviewee exhibited, either through direct emotional expression or by the language being used (7-point scale; anchors: not at all/a lot). Messages that represented the highest pleasantness ratings and lowest unpleasantness ratings were retained for the pleasant condition, and messages that represented the highest unpleasantness ratings and lowest pleasantness ratings were chosen for the unpleasant condition. Messages that scored high in both pleasantness and unpleasantness were retained for the mixed emotional content condition. The three conditions were significantly different in terms of pleasantness ($F(2, 21) = 51.32, p < 0.001$) and unpleasantness ($F(2, 21) = 53.15, p < 0.001$). Post-hoc analyses using Tukey's HSD indicated that (1) pleasant and mixed messages did not differ significantly in terms of pleasantness and (2) unpleasant and mixed messages did not differ significantly on unpleasantness. Considering the coercive nature of mixed messages, this was expected.

Pleasant, unpleasant, and emotionally mixed messages were not rated differently on narrative structure ($F(2, 21) = 0.003, p = 0.997$). Moreover, narrative and non-narrative messages did not differ in pleasantness ($t(22) = 1.316, p = 0.202$) or unpleasantness ($t(22) = 0.554, p = 0.585$).

3.4. Procedure

Participants ($N = 48$) completed this study individually in a research lab located at a large state university. Informed consent was obtained from each participant, and researchers prepared participants for the collection of physiological data. The computer program MediaLab (Jarvis, 2006) controlled the presentation of all instructions, stimulus messages, and questionnaire items. Participants were prompted to ask the researcher questions if they did not understand any instruction. Participants controlled the pace of the experiment by being prompted to strike a key to advance to the next message after they answered questions for the previous message. A small pilot test was conducted before the experiment to assess any procedural problems, which were corrected prior to participant recruitment.

Participants watched the 24 clips on a 32" color television monitor while seated in a comfortable chair that was locked in the recline position. Before the experiment began, participants watched two short video clips from the collection of interviews that were not included in the main experiment. This was done to familiarize participants with the types of content they would see. After completing the study, participants were paid, debriefed, thanked and provided with breast cancer information packets supplied by a local cancer hospital. The entire procedure lasted approximately one hour for each participant.

4. Results

Before reporting the hypotheses and research question tests, we tested the impact of narrative and emotion on arousal. We did this to control for arousal’s potential as an alternative explanation that arousing video content was driving the heart rate findings. A two (narrative) × three (emotion) repeated-measures ANOVA was run on arousal to control for the alternate explanation that arousing video content was driving the heart rate findings. Neither of the main effects (narrative $F(1, 45) = 0.41, p = 0.53$; emotion $F(2, 44) = 1.22, p = 0.30$) nor the interaction was significant for arousal ($F(2, 44) = 1.61, p = 0.21$).

4.1. Hypothesis 1: Resource allocation

H1 predicted that narrative structure with mixed emotional content will increase resource allocation (indicated by heart rate deceleration) compared to the other emotional content or to the non-narrative structure. We tested for effects on heart rate with a two (narrative: yes/no) × three (emotion: pleasant/unpleasant/mixed) × 20 (time: first 20 s of message exposure) repeated measures ANOVA. The results for heart rate represent $N = 37$.¹ There was a significant narrative by emotion by time interaction ($F(38, 1368) = 1.79, p = 0.038, \eta^2_{part} = 0.047$). Figures 1 and 2 illustrate this interaction.

Figure 1 shows the emotion by time interaction for narrative clips only. Narrative messages with mixed emotional content showed the greatest heart rate deceleration over time, while unpleasant narratives showed the least. Figure 2 demonstrates the opposite pattern for non-narrative messages. Non-narrative messages with unpleasant emotional content showed the greatest heart rate deceleration over time, while non-narrative messages with mixed emotional content showed the least. H1 was partially supported in that narrative messages with mixed emotion content showed increased resource allocation. However, narrative messages with unpleasant content showed the least resource allocation (not most, as predicted in H1).

Figure 1. Heart rate: Emotion × time for narratives.

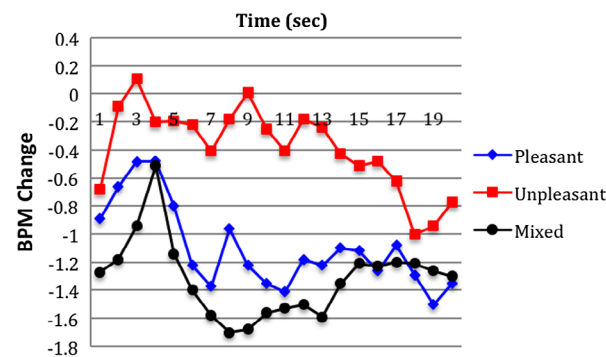
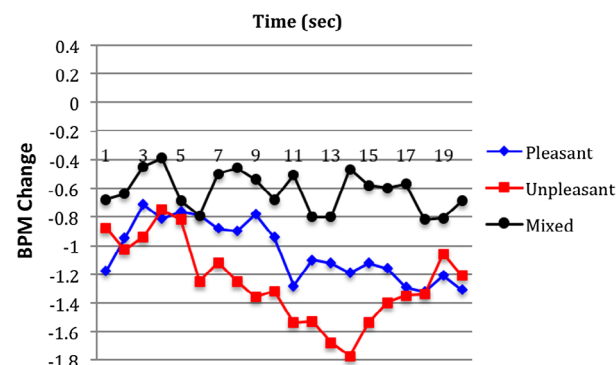
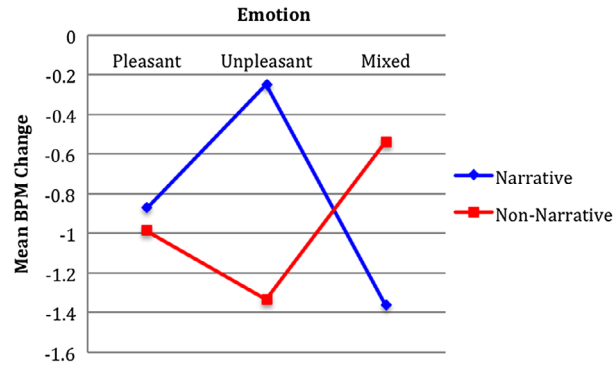


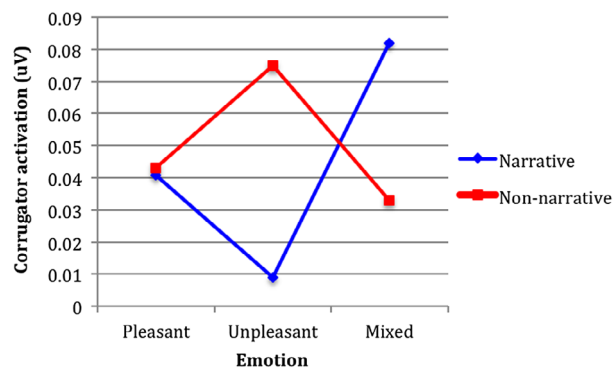
Figure 2. Heart rate: Emotion × time for non-narratives.



**Figure 3. Heart rate:
Emotion × narrative.**



**Figure 4. Corrugator:
Emotion × narrative.**



In addition to the three-way interaction, the interaction between narrative and emotion averaged across time reached significance ($F(2, 72) = 5.15, p = 0.008, \eta^2_{\text{part}} = 0.125$). Figure 3 illustrates this interaction. Heart rate deceleration was greatest for unpleasant non-narrative and mixed narrative messages, and least for unpleasant narrative and mixed non-narrative messages. There was no difference in heart rate between narrative and non-narrative for pleasant messages.

4.2. Hypothesis 2: Emotional response

H2 predicted that negative emotional response (indexed by corrugator supercillii activity) would be higher for narrative structure with unpleasant content than other emotional content or to non-narrative structure. H2 was tested for effects on corrugator with a two (narrative: yes/no) × three (emotion: pleasant/unpleasant/mixed) repeated measures ANOVA. The narrative by emotion interaction approached significance ($F(2, 47) = 2.92, p = 0.063, \eta^2_{\text{part}} = 0.058$), which is shown in Figure 4. However, the interaction obtained was not the hypothesized interaction. Instead, corrugator was most activated for non-narrative unpleasant and narrative mixed messages, and least activated for narrative unpleasant and non-narrative mixed messages. Interestingly, this pattern matches the heart rate pattern in Figure 4, in that the message content that was responsible for the greatest heart rate deceleration (non-narrative unpleasant and narrative mixed) also activated the corrugator muscles the most. The main effect of emotion on corrugator was not significant ($p = 0.50$), nor was the main effect of narrative on corrugator ($p = 0.72$).

4.3. Self-report results

4.3.1. Transportation

H3 predicted that narrative structure with mixed emotional content will increase transportation compared to positive content or to non-narrative structure. A two (narrative) × three (emotion) repeated-measures ANOVA was run on transportation. There was a significant main effect for emotion ($F(2, 44) = 4.08, p = 0.024, \eta^2_{\text{part}} = 0.16$), such that mixed messages elicited greater transportation

($M = 6.80$, $SD = 1.51$) than either pleasant ($M = 6.52$, $SD = 1.40$) or unpleasant ($M = 6.56$, $SD = 1.48$) messages. Neither the main effect for narrative nor the narrative by emotion interaction was significant. H3 was not supported.

4.3.2. Information seeking intention

RQ1 asked: How do narrative structure and emotional content impact information seeking intention? To test RQ1, a two (narrative) \times three (emotion) repeated-measures ANOVA was run on information seeking intention. There was a main effect for narrative ($F(1, 45) = 8.35$, $p = 0.006$, $\eta^2_{\text{part}} = 0.157$), such that non-narratives ($M = 7.64$, $SD = 1.40$) encouraged greater information seeking intention than narratives ($M = 7.23$, $SD = 1.66$). Also, there was a main effect for emotion ($F(2, 44) = 4.05$, $p = 0.024$, $\eta^2_{\text{part}} = 0.155$) such that mixed messages elicited the highest information seeking intention ratings ($M = 7.57$, $SD = 1.45$), followed by unpleasant ($M = 7.45$, $SD = 1.51$) and pleasant ($M = 7.28$, $SD = 1.59$) messages. The narrative by emotion interaction was not significant ($F(2, 44) = 0.95$, $p = 0.395$).

5. Discussion

The purpose of this study was to examine cognitive and emotional effects of narrative and non-narrative breast cancer messages that varied on emotional content on African-American women at least 40 years of age who had not been diagnosed with breast cancer. It was suggested that cognitive and emotional effects would vary as a function of the message structure and emotional tone of the messages. Guided by the LC4MP, we predicted that narrative structure with mixed emotional content would increase resource allocation compared to the other emotional content or to the non-narrative messages. To test this, we examined cognitive effects using measures of attention (cognitive resources allocated to a message indicated by heart rate deceleration) and negative emotional response (changes in corrugator muscles activation). In addition, we were interested in several important self-report effects: transportation and information seeking intention.

Numerous studies show that narrative messages invite engagement (Clark, 1996; Traugott & Pratt, 1980), influence relevance (Labov, 1972), encourage heuristic processing (Robinson & Hawpe, 1986), increase enjoyment (Bilandzic & Busselle, 2006; Green et al., 2004), impact persuasiveness (Slater & Rouner, 2002), encourage transportation (Gerrig, 1993; Green & Brock, 2000), increase absorption (Graesser, 1981), and have a significant impact on cognition and affect (Lang, Sias, et al., 1995; Schneider et al., 2004). The present research extends these findings to breast cancer narratives, demonstrating that narrative message structure and emotional content interact in interesting and surprising ways on cognitive resource allocation and emotional responses of a targeted, at-risk sample. Additionally, our results inform previous research on narratives in cancer communication as a way to elicit audience reactions (Green, 2006; Kreuter et al., 2007; Oliver et al., 2012).

Specifically, we found cognitive and emotional processing was superior for narratives, but only when the narratives contained mixed emotional content. That is, cognitive resource allocation (indicated by heart rate decelerations) and corrugator response were both higher for narratives when the narratives contained both pleasant and unpleasant content. Conversely, our results also indicate that non-narrative messages outperformed narrative messages on resource allocation and emotional response when it came to unpleasant emotional content.

With the preponderance of narrative effects research showing an emotional and cognitive advantage of narrative over non-narrative message structures, why would narrative increase resource allocation and emotional response for mixed emotional content but non-narrative increase resource allocation and emotional response for unpleasant content? The advantage for narrative-mixed content comports with the LC4MP, which states that emotional, motivationally relevant stimuli would increase attention and emotional response to the extent that the stimuli engage the appetitive and aversive motivational systems at higher levels. Since narratives have been shown to increase attention and since mixed messages are co-active in the sense that both pleasant and unpleasant content in these messages engage both motivational systems, the LC4MP would predict processing

advantages for narrative structure with mixed emotional content. But why then would narrative structure with unpleasant content reduce both attention and emotional response? This message combination may cause a defensive response. There is ample research that shows that when messages become too demanding of cognitive resources or too toxic, individuals tend to cognitively and emotionally withdraw from the message. Leshner, Bolls, & Wise (2011) for example found the combination of fear and disgust content in anti-tobacco messages also showed accelerated heart rate, reduced corrugator response, and reduced recognition memory. They theorized that the message content caused not only withdrawal from the message but that individuals were exhibiting defensive responding.

Conversely, non-narrative message structure with unpleasant content increased attention and showed stronger corrugator response, but non-narrative message structure with mixed content decreased attention and showed weaker corrugator response. Non-narrative structure tends to be less motivationally relevant than narrative structure, but the unpleasant content engages the aversive motivational system, which increases resource allocation and negative emotional responding. The pattern of resource allocation and corrugator response obtained here for non-narratives appears to run counter to Lang et al. (2013). It seems that for non-narratives in our study, the unpleasant content engaged the aversive motivational system more than the mixed content. This may be a matter of degree, whereby the pleasant content in coactive messages attenuates the activation of the aversive system by the unpleasant content. Although it is difficult to predict the message threshold where cognitive and emotional engagement deteriorates into defensive responding, it is important to understand the possibility of messages surpassing that threshold. Hence, we strongly suggest that message designers test their messages prior to campaign implementation to assure that their messages do not encourage defensive responding.

Previous studies comparing breast cancer survivor narratives to informational videos delivered by a non-survivor narrator have demonstrated the value of narratives (Kreuter et al., 2010; McQueen et al., 2011). But the authors of these studies also acknowledge that their findings cannot distinguish between the effects of narrative (content) vs. survivor (messenger). The present findings reinforce the need to examine this difference more closely. In the current study, the narrative and non-narrative videos were both delivered by breast cancer survivors. This raises the possibility that for some message content, survivor status may trump narrative style. Future research should explore the independent and combined effects of the two variables.

In addition, like statistical messages (Greene & Brinn, 2003), the non-narrative messages used in this study may have been perceived as more informational than the narratives and thus elicited greater allocation of attentional resources. Further, non-narrative messages led to greater self-reports of information seeking intention. This may be because narrative messages, which included testimonials concerning an individual's breast cancer story, provided a specific example of what others with a similar condition might expect. Thus, non-narratives may have left participants with unanswered questions resulting in an indication to seek out additional information.

Mixed messages resulted in greater transportation than the unpleasant messages or the pleasant messages, while the narrative structure of the message had no significant impact on transportation. Transportation theory would predict that the narrative messages would increase transportation compared to the non-narrative messages (Green, 2006; Green & Brock, 2000). We did not find that here. That may be in part due to the fact that our stimuli were short messages, probably not the kinds of messages that create mental and emotional engagement that program-length messages with developed characters and plots often used in transportation studies. Alternatively, transportation theory also suggests an important role for "character identification". In other words, transportation is enhanced when people identify with the characters in the narrative, and perhaps the mixed messages increased participants' identification with the cancer survivor. It is tempting to surmise that the mixed messages were more emotionally intense than the unpleasant and pleasant messages and therefore were more engaging. But remember that neither the narrative nor emotional

messages varied on arousal, so the advantage of transportation for mixed emotional messages could not be due to stronger emotional intensity. We also caution interpretation of the transportation findings because we used only three items in our index designed to measure transportation, which likely did not tap the full range of engagement required to observe measurable transportation effects. Thus, the interactive influence of narrative and emotional valence on transportation remains an open question.

Our study found that non-narrative messages resulted in greater information seeking intentions. This finding may be the result of the character of the non-narrative messages. Most of the non-narrative messages in the current study displayed the cancer survivor providing advice to the viewer on things to do (e.g. get a mammogram) or things not to do (e.g. don't wait to get a mammogram). Information seeking intention is likely due to specifics of message content, especially if the didactic nature of the message is in the form of advice-giving, which may leave unanswered questions for the viewers (e.g. where do I get a mammogram?). Also risk appraisals have been shown to increase information seeking intentions (Turner et al., 2006), we can add another factor that may increase them.

5.1. Limitations and future study

One of the limitations of this study was the use of single item measures to examine arousal and information seeking. Some of the problems with single item measures include inability to fully capture a concept and increased measurement error (Blalock, 1970; Moïn pour, 2000; Nunnally & Bernstein, 1994). Multiple-item measures may provide the opportunity to capture more of the concept and reduce measurement error (Fuchs & Diamantopoulos, 2009). This decision was a matter of the design in this study, which required us to limit the number of questions each participant had to answer for each message because of participant fatigue. Lab studies that use multiple messages and record psychophysiological responses require a significant amount of time for preparation, data collection, and sensor removal/debriefing. So what we lost in measurement reliability for these items, we gained by including multiple messages and psychophysiological measures.

Future research may also consider the inclusion of a speeded recognition task (Lang, 2006). Recognition indexes encoding, which would help both inform and verify the heart rate findings. Also, additional psychophysiological measures, such as skin conductance (physiological indicator of arousal) and orbicularis oculi (indexes pleasant emotional response) may help tease out of the effects of emotionally mixed messages.

5.2. Implications

Overall, our goal was to better understand how breast cancer testimonials would impact cognitive and emotional responses, attitudes, and behaviors. It is our hope that these findings will help guide the production of more effective breast cancer campaign messages. Our investigation was important in distinguishing nuances where narrative and non-narrative messages influence cognitive and emotional responses. Specifically, narrative messages with mixed emotional content and non-narrative messages with unpleasant content stimulate resources allocated to attention. From the LC4MP and motivated cognition perspective, our findings suggest that emotional valence interacts with narrative structure on attention and emotional response. Not only do these findings suggest caution when theorizing the advantages of narrative over non-narrative message structure, but they also indicate valuable information for breast cancer message designers as many current breast cancer messages focus on stories of hope (e.g. you're not alone), negative consequences (e.g. death) or information (e.g. perform self exams).

By using a within-subjects experimental design with members of the population most at risk—African-American women age 40 or older who had not yet been diagnosed with breast cancer—we were able to carefully observe how narrative/non-narrative messages with differing emotional content influenced cognition and affect. Because the women in our sample are part of the at-risk population and they have not been previously diagnosed with this disease our findings are applicable to

the population of concern. In addition, we were able to rule out the effect of arousing video content on heart rate results by using a self-report measure to examine arousal. Further strengthening our research design was the combination of physiological measures and self-report measures. The psychophysiological measures likely provided data and insight that could not have been obtained in other ways.

Developing and targeting messages for African-American women, the group with the highest rates of breast cancer incidence and breast cancer mortality, is important in the fight against breast cancer. The effectiveness of strategic messages that use narrative message structure appears to depend on the emotional content of the message. For promotion and detection practices, such message design may help decrease the mortality rate in this group.

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Note

1. Data from eleven participants were unavailable due to equipment and operator error.

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Appendix

Table 1. Pretest ratings for stimulus messages

Message condition	n	Narrative	Pleasantness	Unpleasantness
Narrative	12	1.83 (0.807) ^a	5.04 (2.050)	4.96 (2.271)
Non-narrative	12	6.02 (0.644) ^a	4.00 (1.822)	4.50 (1.745)
Positive	8	3.88 (2.134)	6.06 (0.980) ^b	2.25 (0.886) ^c
Negative	8	3.97 (2.487)	2.06 (0.563) ^b	6.38 (0.791) ^c
Mixed	8	3.94 (2.441)	5.44 (0.943) ^b	5.56 (0.863) ^c

^adifference is significant ($t(22) = 14.051, p < 0.001$).

^bdifference is significant ($F(2, 21) = 51.32, p < 0.001$), except that positive and mixed conditions do not differ.

^cdifference is significant ($F(2, 21) = 53.15, p < 0.001$), except that negative and mixed conditions do not differ.



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