Perceived risk mediates the impact of mood on the effectiveness of health PSAs
Implications for public health marketing

Sela Sar
Greenlee School of Journalism and Communication, Iowa State University, Ames, Iowa, USA, and
George Anghelcev
College of Communication, Department of Advertising and PR, Penn State University, University Park, Pennsylvania, USA

Abstract
Purpose – The aim of the paper is to investigate the impact of pre-existing audience mood on responses to health public service advertisements (PSAs). The paper also aims to show the practical and theoretical importance of mood as a variable in health communication.

Design/methodology/approach – Hypotheses regarding the impact of audience mood on the outcome of health PSAs were tested experimentally using health PSAs about vaccination and virus detection behaviors.

Findings – The influence of pre-existing mood was mediated by the perceived risk of contracting the illness mentioned in the health advertisement. Personal estimations of risk mediated the impact of audience mood on behavioral intent and actual behavior. The more negative one’s mood, the higher the perceived risk of contracting the disease mentioned in the message, and the more likely one was to adopt the precautionary behavior recommended by the PSA. Positive mood had opposite effects.

Practical implications – The findings suggest a novel media planning approach to maximizing the effectiveness of health risk messages. Due to the impact of context-induced mood on perceptions of risk, messages could be more effective if placed in editorial contexts which induce negative mood (e.g. crime investigation reports) versus environments which induce positive mood (e.g. sitcoms), because negative mood makes people think they are more at risk and motivates them to act.

Originality/value – The mood-and-risk mediation hypothesis proposed here has never been examined in public health marketing. Findings call for further research on the impact of contextual affect on responses to public health communication. The paper suggests a new placement technique for media planners working in public health advertising.

Keywords Affect, Mood, Health communication, Public health PSA, Advertising, Public health

Paper type Research paper

According to a comprehensive report released by the National Cancer Institute, marketing communication has become a major tool for health practitioners in their efforts to improve public health (Randolph and Viswanath, 2004). Indeed, health communication campaigns, defined as the strategic use of media to disseminate health information and induce changes in health-related attitudes or behavior, have been used

The authors have contributed equally and are listed in reverse alphabetical order.
to address a variety of public health topics. Examples include vaccination, exercise, substance use prevention and cessation, family planning, use of health services, and many others (Snyder, 2007).

In view of practitioners’ reliance on theory, the validity of the theoretical frameworks which guide health campaign strategy is very important. Yet, most of the theoretical models which underlie the design and implementation of health communication campaigns do not account for the impact of some important variables on the effectiveness of health communication.

For example, there is a pervasive assumption that people are rational decision-makers. The dominant theoretical frameworks which guide campaign strategy emphasize the role of rational thought in guiding responses to health appeals. For example, within The Theory of Reasoned Action (Fishbein and Ajzen, 1975), The Health Belief Model (Becker, 1974), The Theory of Planned Behavior (Ajzen, 1991) and The Social Learning Theory (Bandura, 1977) the influence of affective factors such as the mood of the audience is largely ignored.

In advertising and consumer psychology, it has been long recognized that affect is an important determinant of message effectiveness. For example, the editorial environment in which the messages are embedded can place the audience in a negative or positive mood, which further influences memory for the message (Goldberg and Gorn, 1987), message evaluation (Aylesworth and MacKenzie, 1998), attitudes toward the brand (Batra and Stayman, 1990) and behavioral intent (Janssens and De Pelsmacker, 2005).

How does the pre-existing mood of the audience shape its responses to health messages? The present study attempts to answer this question by testing the possibility that pre-existing mood can alter people’s perceptions of the risk of contracting the disease mentioned in the message. It is suggested that the resulting (biased) risk estimates guide attitudinal and behavioral responses to the communication. This risk mediation hypothesis (Figure 1) is tested experimentally, and the findings are discussed in view of theoretical and practical implications for health communication.

**Theoretical rationale**

Moods are defined as mild and generalized affective states ranging from positive to negative valence. Moods differ from discrete emotions (e.g. joy, anger, fear, guilt). Whereas emotions are short-lived affective reactions to specific stimuli, moods are mild, last longer and have less salient causes (Clore et al., 2001; Frijda, 1994; Watson and Clark, 1994). A person’s mood is usually described as positive, neutral or negative.

Because moods tend to last, their influence extends beyond the context which triggered the mood. The possibility, that the mood experienced by consumers as a result

![Figure 1. The proposed mediation model](image-url)
of various life events can shape the way in which consumers interpret subsequent messages, has been the focus of mood research in advertising and marketing. Thus, in these fields mood has been studied primarily as incidental affect. Emotions, however, tend to dissipate faster; in advertising and marketing, discrete emotions have been studied primarily as affect induced by (integral to) the message (Cohen et al., 2008).

In this study, health communication research is defined as the study of how messages containing health information are designed and disseminated among the public, and how those messages affect individuals. In health communication research, only the second approach to the study of affect – namely, the impact of message induced emotions on message effectiveness – has been undertaken programmatically. Most notable are the programs of research on specific emotions conducted by Dillard and colleagues (Dillard and Nabi, 2006; Dillard and Peck, 2001, 2000; Dillard et al., 1996) and by Nabi and colleagues (Nabi et al., 2008; Nabi, 2002, 2003). With few exceptions (Mitchell, 2001; Yan et al., 2010), the role of mood as a determinant of health message effectiveness remains underexplored.

In one of the few available investigations of the impact of mood on health message outcomes, Mitchell (2001) exposed positive and negative-mood induced participants to positive (gain) and negative (loss) framed messages about a sexually-transmitted disease. Drawing from Prospect Theory (Kahneman and Tversky, 1979) and from literature on mood and message framing effects (Wegener et al., 1994), Mitchell (2001) hypothesized a two-way interaction between mood and health message frame on perceptions of threat, efficacy, attitude, intention and actual behavior. She expected gain message frames to be more effective for people in a positive mood and loss message frames to be more persuasive for people in a negative mood. Although the means were generally in the expected directions, the data did not support the interaction hypotheses. In discussing the findings, Mitchell (2001) called other persuasion researchers to further examine the mediators and moderators of mood effects on health message effectiveness.

Almost a decade later, Yan et al. (2010) found an interaction between pre-existing audience mood (positive, negative), health message frame (gain, loss) and type of health advocacy described in the message (prescriptive, restraint). Gain frames were found more effective when coupled with positive mood and prescriptive advocacy and loss frames were more effective when coupled with negative mood and restraint advocacy. The effects were attributed to the activation of the behavioral approach system (BAS) by positive mood and of the behavioral inhibition system (BIS) by negative mood.

In other communication domains, there is ample empirical evidence that the mood of an audience can change the way in which the audience responds to persuasive communication. For example, in a study of advertising effectiveness, Goldberg and Gorn (1987) showed that the mood induced by happy or sad TV programs influences the affect experienced during subsequent commercials. They reported “greater perceived commercial effectiveness, more positive cognitive responses and, to some extent, better recall” in the case of positive (vs negative) programs (p. 387). Others found that the mood induced by a preceding program can change the evaluation of subsequent messages (Kamins et al., 1991) and the acquisition of information from subsequent commercials (Mundorf et al., 1991). Finally, Lord et al. (2001) reported mood-congruent effects on memory (information recall).

Many studies in psychology underscored the effects of mood on message evaluation, message memory, attitudes and behavior (for recent reviews see Loken, 2006;
Schwarz and Clore, 2003). In marketing and communication research, the finding that pre-existing mood affects the outcome of persuasive communication has been replicated numerous times (for recent reviews, see Cohen et al., 2008; Hullett, 2005). In view of this literature, it should be expected that pre-existing mood will also shape the effectiveness of health messages (Figure 1, Path C).

Of particular interest to health marketing scholars, as well as to campaign managers, are the psychological processes which underlie the effects of mood. In other words, are there variables which may moderate or mediate these effects? The present article makes a theoretical contribution, by investigating the possibility that the impact of mood on the effectiveness of health messages is mediated by the perceived risk of contracting the illness which is the focus of the campaign.

To show that the proposed mediation occurs, empirical evidence is first discussed suggesting that mood has an impact on risk perceptions (Figure 1, Path A). Then, evidence of the link between risk and behavior change is presented (Figure 1, Path B). Finally, a series of regression analyses are performed to establish that the processes shown in Figure 1 meet the formal criteria of a mediated relationship.

Mood as a determinant of perceived risk
According to Slovic et al. (2004), people estimate risk by assessing it analytically and/or by relying on their intuitions and feelings. The analytical route makes use of logic-based algorithms and normative rules, requires time and effort, and constitutes an act of conscious assessment. The experiential route is mostly automatic, and it relies on intuition (Gilovich et al., 2002; Kahneman, 2003; Hanselmann and Tanner, 2008) and affect (De Vries et al., 2008a, b; Västfjäll et al., 2008).

The influence of mood on subjective perceptions of risk was first demonstrated empirically in a pioneering study by Johnson and Tversky (1983). The two researchers showed that the mood induced by a newspaper story altered perceptions of risks in the direction of the experienced mood. People in a negative mood consistently overestimated the likelihood of bad events happening, and people in a positive mood consistently underestimated the likelihood of bad events happening. Interestingly, the effects were independent of the similarity between the story used to induce the mood and the type of risk they were asked to estimate after reading the story (Johnson and Tversky, 1983). For example, accounts of a fatal stabbing increased people’s estimates of the likelihood of a closely related risk, homicide, just as much as they did estimates of unrelated risks such as natural disasters (Johnson and Tversky, 1983). Apparently, pre-existing mood can induce a generalized bias on risk estimates consistent with the valence of the experienced mood state. Specifically, people in a positive mood become more optimistic and people in a negative mood become more pessimistic about the risks of a negative event happening in the future.

The same pattern of findings was reported by Salovey and Birnbaum (1989). They induced happy, sad, and neutral moods in healthy and non-healthy experimental participants. They found mood-congruent effects among both groups on perceptions of physical symptoms and on beliefs about one’s ability to engage in symptom – alleviating behaviors. The authors also reported that vulnerability estimates among healthy participants were mood sensitive, with healthy positive mood participants seeing themselves less vulnerable to possible future negative health events than negative mood participants.
Wright and Bower (1992) induced mood by way of hypnosis in subjects unaware of the purpose of an experiment. Following mood induction, participants estimated the likelihood of 22 positive and negative events happening. The likelihood of risky/negative events taking place in the future was overestimated by negative mood subjects and underestimated by the positive mood subjects, compared with their neutral mood counterparts. The noted effect was attributed to the biased, mood-congruent retrieval from memory of information used to compute the likelihood estimates. Based on a spreading activation model of memory nodes linked in an associative network, the authors postulated that when a certain affective state is activated, affect-congruent information should be more easily retrieved than affect-incongruent information. Subjects in a negative mood were more likely to retrieve negative information and to form pessimistic judgements, overestimating the chances of a negative event happening. The reverse was found among people induced with a positive mood.

The same explanation was offered by Nygren et al. (1996), who observed that positive mood induced by an unexpected gift caused people to underestimate the probabilities associated with phrases for losing relative to winning in the context of a fictional betting game. Constans and Mathews (1993) proposed the same mechanism. They induced mood by asking participants to imagine positive and negative events and found overestimation of risks for negative events among people in a negative mood and underestimation of the same risks among people in a positive mood.

The spreading activation account was rejected by Johnson and Tversky (1983), who believed their findings were due to a misattribution of mood effects. They reported evidence that people involuntarily use mood-as-information for evaluating salient stimuli (e.g. how do I feel about it?) even when the mood is not caused by the stimulus being evaluated. They believed that the use of mood-as-information colored participants’ perceptions of risk in the direction of the experienced mood (for a review of mood-as-information research, see Schwarz and Clore, 2003). The mood-as-information hypothesis was also supported by Gasper and Clore (2000), who found that negative (vs positive) mood caused college students to overestimate (vs underestimate) the risk of unpleasant personal events. Finally, Västfjäll et al. (2008) used the same explanation to show that the negative mood induced by reminding people of the 2004 tsunami influenced their estimates of well-being and created a pessimistic bias in future risk estimates.

Importantly, the mood-as-information account and the spreading activation account do not preclude one another. Research suggests that the reported effects were likely obtained under different information processing conditions (see Forgas (1995), for an integrative theory, or Constans and Mathews (1993), for clarification about when spreading activation may cause the effect). Indeed, Fedorikhin and Cole (2004) recognized both accounts as possible explanations of mood effects on estimations of risk, but under different conditions.

In an effort to integrate various explanations of the role of affect in health persuasion, Peters et al. (2006) proposed an integrative framework which describes the functions of both mood and specific emotions in the construction of health preferences. The authors postulate four mechanisms by which affect can influence health-related decision. First, affect could be used as information in forming message evaluations. Second, affect can serve as a “spotlight”, by focusing attention on different aspects of the presented health information. Third, affect can motivate or demotivate detailed processing of health information. Fourth, affect can serve as “common currency”
by allowing one to decide between otherwise similar or hard to compare health decision options (p. S142). The functions of affect as information and affect as motivator apply directly to incidental affect or mood. The functions of affect as spotlight and affect as common currency are discussed in relation to integral affect/specific emotions.

Therefore, in addition to the aforementioned mood-as-information and spreading activation accounts, Peters et al. (2004) describe a third psychological mechanism by which mood can influence health-related decisions. Specifically, mood is thought to increase or decrease one’s motivation to process in detail the information contained in the message. This proposition is consistent with the hedonic contingency hypothesis, which showed that engage in behavioral and cognitive strategies designed to maintain positive moods and reduce negative moods (Raghunathan and Trope, 2002). According to the framework proposed by Peters et al. (2004), negative mood could influence risk perceptions by motivating people to only process messages which are framed positively or which describe strategies to reduce the risk of a disease (because processing such messages would likely alleviate one’s negative mood). Conversely, positive mood could influence risk perceptions by de-motivating people to process messages in detail for fear that exposure to the message may reveal possible health threats and reduce one’s positive mood.

Whether mood-congruent effects on subjective perceptions of risk are caused by spreading activation of semantic and affective memory nodes, by the use of affect as information, or by other psychological processes, the pattern of effects is unequivocal. Subjective risk estimates for negative events appear to be systematically and predictably biased by pre-existing mood. Thus, people in a negative mood are overestimating and people in a positive mood are underestimating the risk that negative events may occur in the future. For positive events, the influence of mood is in the opposite direction.

The possibility of contracting an illness is generally regarded as undesirable and negative. Therefore, it should be expected that people in a positive mood will underestimate the likelihood of contracting the illness mentioned in a health message, whereas people in a negative mood will overestimate the risk of contracting the illness:

$H1$. The more negative a person’s mood, the higher their perceived risk of contracting the disease mentioned in a health message.

$H2$. The more positive a person’s mood, the lower their perceived risk of contracting the disease mentioned in a health message.

Three additional reasons suggest the hypotheses should be supported by data.

First, the effects have been observed for transitory mood as well as for trait mood. For example, Pietromonaco and Markus (1985) obtained the same mood effects on subjective risk in an experiment using mood as a trait (vs state). Among other tasks, they asked 75 female subjects to think about an array of negative (and positive) future events. Then, participants were instructed to imagine themselves in the events and to estimate the likelihood that the events would happen to them. Using a screener, half of the subjects were categorized as chronic experiencers of mildly negative mood (i.e. mildly depressed). The other half were categorized as non-depressed. In comparison with non-depressed people, depressed persons significantly overestimated the risk of negative events happening in the future.

Second, with one exception (anger), experimental research on the role of discrete emotions in altering perceptions of health risk indicates that negative emotions like sadness or fear influence perceptions of risk in the same direction as it is predicted here.
for negative mood, and positive emotions like happiness and joy influence perceptions of health risk in the same directions as is predicted here for positive mood (Lerner et al., 2003; Lerner and Keltner, 2001; Fischhoff et al., 2005; Lerner and Gonzales, 2005).

Third, data from correlational studies shows that (state and trait) negative mood is associated with overestimation of health risks, while (state and trait) positive mood is associated with underestimation of health risks (Mayer and Volnath, 1985; Alloy and Ahrens, 1987; Welkenhuysen et al., 1996; Gasper and Clore, 1998; Gupton et al., 2001; Vaughn and Weary, 2002).

**Perceived risk as a determinant of health message effects**

Communication campaigns in public health marketing often contain information about the risks associated with particular illnesses. A reminder campaign to protect one’s skin against the harmful effects of the sun may list the potential hazards associated with not using sunscreen; a campaign for vaccination against the human papillomavirus (HPV) may include information about the possibilities or the dangers of contracting that virus (Rothman et al., 1999). According to the Health Belief Model (Becker, 1974), the likelihood of engaging in the recommended behavior depends, among other factors, on how the audience perceives the communicated risk. Thus, people should be more likely to regularly use sunscreen if they perceive there is a relatively high (vs low) risk of getting skin cancer by not using it; they should be more likely to get a vaccine if they believe there is a relatively high (vs low) chance to become infected with the virus, etc. (Rothman et al., 1999).

The influence of perceived risk on health behavior change is recognized by many other health behavior models, including The Self-Regulation Model of Health Behavior (Leventhal et al., 1984), Protection Motivation Theory (Rogers, 1983), the Precaution Adoption Model (Weinstein, 1988a, b, 1984), the Extended Parallel Process Model (Witte, 1992), and the Information Motivation Behavior Model (Fisher and Fisher, 1992). Empirical data supporting these models reveal that perceived risk is a determinant of attitudes, behavioral intentions and actual behaviors across health domains (for meta-analyses, see Harrison et al., 1992; McCaul et al., 1996; Floyd et al., 2000; Milne et al., 2000; Brewer et al., 2007).

Much of the literature refers to vaccinations or immunizations. For example, Brewer and Fazekas (2007) systematically reviewed all available studies of beliefs and acceptability of vaccination against HPV, which is known to cause cervical cancer – a disease responsible for an estimated 237,500 deaths a year among women. They concluded that vaccination acceptability was higher when people believed the risk of HPV infection was higher (Boehner et al., 2003; Olshen et al., 2005; Friedman and Shepeard, 2006). The review recommended that public health marketing programs in the US designed to promote anti-HPV vaccination should emphasize the high risk of contracting HPV. Perceived risk/likelihood of infection was identified as one of three factors most likely to influence parents’ intentions to vaccinate their children.

Data from a longitudinal study of 745 adults in three US counties highly affected by Lyme disease also suggested that high perceived risk may increase vaccination behavior against that disease (Brewer et al., 2004). Higher perceived risk was associated with higher intentions to vaccinate and higher rates of immunization behavior against many other diseases, including the common influenza (Chapman and Coups, 2006), swine flu (Cummings et al., 1979), and pneumonia (Madhavan et al., 2003).
A comprehensive meta-analysis of the relationship between risk perception and health behavior in the area of vaccination concluded that “the consistent relationships between risk perceptions and behavior, larger than suggested by prior meta-analyses, suggest that risk perceptions are rightly placed as core concepts in theories of health behavior” (Brewer et al., 2007, p. 136).

Admittedly, vaccination is a type of behavior more likely influenced by perceptions of risk than other types of health-related activities, such as exercising or eating healthy (Brewer et al., 2007). However, the finding that perceptions of risk determine attitudes, behavioral intent and actual behavior extends beyond vaccination, to behaviors like mammography screening (see McCaul et al., 1996, for a meta-analytic review of that literature), the use of contraception (Burger and Burns, 1988), use of child safety restraints in cars (Ameson et al., 1985), weight loss (Kirscht et al., 1978), doctor visits in case of symptoms (Berkanovic et al., 1981), diet and foot care (Cherkoney and Hart, 1980), and many others.

In sum, there is a wealth of empirical evidence of a positive relationship between the perceived risk/likelihood of contracting a disease and precautionary behaviors or intentions to undertake them. The higher the perceived risk, the more likely people are to engage in a behavior, and vice-versa. The following hypothesis is proposed about the effect of perceived risk on behavioral intent and actual behavior, as indicators of health message effectiveness:

\[ H3. \] There will be a positive relationship between perceived risk and health message effectiveness, so that the higher the perceived risk, the more effective the message would be in terms of its impact on behavioral intent and actual behavior.

\( H1-H3 \) are pre-conditions for the proposed mediation model, but they do not explicitly postulate that risk will mediate the effects of mood on health message effectiveness. To test the specific mediation model outlined in Figure 1, the following hypothesis is proposed:

\[ H4. \] The effect of mood on health message effectiveness (i.e. behavioral intent and actual behavior) will be mediated by the perceived risk of contracting the disease mentioned in the message.

**Method**

**Study design**

The study was a 2 (mood: positive, negative) × 2 (type of health message: detection-framed, prevention-framed) between-subjects experimental factorial design. The design included both prevention and detection appeals because these are the most commonly used types of campaign messages in public health marketing. It was important to show that the predictions will directionally hold for both types of messages (no expectations existed that there would be any differences).

A total of 288 undergraduates aged 18-28 (55 percent women, 45 percent men, \( M_{\text{age}} = 21.8 \)) participated for extra credit and were randomly assigned to the four experimental treatments. 71 participants were assigned to positive mood/prevention message framed condition; 74 participants were assigned to negative mood/prevention message condition; 72 participants were assigned to positive mood/detection message framed condition; 71 participants were assigned to negative mood/detection message framed condition.
Upon arrival at the lab, subjects were told that they would be participating in two separate studies: the first concerned the effect of music on a cognitive task, and the second was a survey of health behaviors.

The alleged first study was a disguised mood manipulation procedure (see next section for details).

Participants were instructed to remove the headphones when the music ended, and were then given a booklet with the health message as part of an allegedly unrelated second study. They were told to look at one of the two versions of a print public service advertisement (PSA) about the West Nile Virus that was taken out from a local newspaper and modified to fit with the current study. The West Nile Virus was chosen because data were collected during a season when infections had been detected in neighboring states, thus increasing the face validity and believability of the study. The dependent measures were administered after participants had finished reading the health PSA.

The mood measures were taken at the end of the study to avoid drawing participants’ attention to the potential mood effects of the music. Previous studies have found that drawing attention to current mood states can eliminate the effects of mood on the dependent measures (Schwarz and Clore, 1983).

**Mood manipulation procedure**

The mood-inducing procedure, known as the continuous music technique, was adapted from Eich and Metcalfe (1989), see also Niedenthal et al. (1997). Other successful mood induction procedures reported frequently in the literature are the Velten technique (in which mood is induced by asking participants to recount a happy or sad personal experience; for a review see Kenealy, 1986), exposure to happy or sad videos (Forgas, 1998, 1999) or listening to positive or negative-mood-inducing music (Eich and Metcalfe, 1989). Over time, each procedure has had its proponents (Albersnagel, 1988; Pignatiello et al., 1986, for music; Finegan and Seligman, 1995; Velten, 1968 for the Velten technique; Forgas, 1995, 1999 for short films). One observation that may put the music technique at an advantage is that the other methods can also induce differences through cognitive priming (Albersnagel, 1988; Pignatiello et al., 1986). To avoid such a possibility, music was used to induce moods. Participants listened to selections of either “happy” or “sad” classical music, interspersed with instructions, throughout the experimental session. No mention was made of the emotionality of the music or the intent of the manipulation. None of the selections was repeated during the experimental session. For a list of the music selections, see Table I.

**Message manipulation**

The manipulation of message type (prevention-frame, detection-frame) was adapted from Rothman et al. (1999). In line with conceptual definitions, the difference between

<table>
<thead>
<tr>
<th>Positive mood</th>
<th>Negative mood</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allegros from Eine Kleine Nacht Musik, Divertimento No. 136, Ein Musikalischer Spass, (Mozart) and Concerto for Hapsichord and Strings in E major (Vivaldi)</td>
<td>Adagio for Strings (Baber), Addagiotto (Mahler), Adagio from Piano Concerto No. 2 in E Minor (Rachmaninov)</td>
</tr>
</tbody>
</table>

**Table I.**

Music used to induce mood
the prevention and the detection messages was that the former emphasized what one could do to prevent becoming infected with a virus, while the latter emphasized what one could do to detect the presence of the viral infection. The resulting two versions of a West Nile Virus full-page health PSA were designed and modified to appear professional and were attributed to the local community clinic. One version had a detection focus; the other version had a prevention focus. Accordingly, the following detection health PSA message was developed:

> A significant number of people are infected with the West Nile Virus. Doctors recommend that everyone make an appointment to be tested for the West Nile Virus. When you arrive at your appointment you will receive a small injection of inactive viral material. Three days later, you must return to your doctor for a brief follow-up. If your skin has had a positive reaction to the injection, you will receive an oral medication that will eliminate the virus (Rothman et al., 1999, p. 1358).

The prevention health behavior message was:

> A significant number of people are infected with the West Nile Virus. Doctors recommend that everyone receive a complete inoculation. To do so, you will need to make an appointment to receive a single injection of the West Nile Virus. Three days later, you must return to your doctor for a brief follow-up and to receive a second, oral dose of the vaccine.

Note that the only difference between the two messages was that the detection-framed message emphasized diagnostic treatment, whereas the prevention-framed message emphasized the preventing procedure.

A pre-test was conducted with a separate set of 68 participants in order to assess if these message differences would induce a successful prevention-detection manipulation. Participants were asked to indicate whether the information they received emphasized the prevention behavior (i.e. preventing procedure) (=1), the detection behavior (i.e. diagnostic treatment) (=2), or neither the prevention behavior nor the detection behavior (=3). Of the participants in the prevention condition, 100 percent correctly identified receiving the prevention-framed health message; of those in the detection condition, 2 percent incorrectly believed they received the prevention-framed health message, and 98 percent correctly believed they received the detection-framed health message (Fisher’s test: $p < 0.0005$). None of the participants chose the third category. The pre-test indicated that the chosen technique induces a successful prevention-promotion manipulation.

**Dependent measures**

To assess message effectiveness, two dependent variables were measured, namely intention to engage in the behavior recommended by the message, and actual behavior (removal from the brochure of a business card containing information about appointments with a physician specialized in the West Nile Virus).

*Behavioral intention.* Three behavioral intention measures previously used by Rothman et al. (1999) were employed to assess participants’ intentions to perform the recommended behavior:

1. How likely would you be to get (the inoculation/a test for viral infection) sometime soon?
(2) If you were faced with the decision of whether to get (the inoculation/tested for the viral infection) today, how likely is it that you would do so?

(3) How tempted would you be to put off getting (the inoculation/a test for the viral infection)? (reverse-coded).

Each item was assessed on a seven-point scale ranging from 1 (not at all) to 7 (extremely). The items were combined into a single index with the third item reverse-scored (Cronbach’s α = 0.85).

**Actual behavior.** At the end of the experiment, participants were informed that if they are interested in getting more information about the West Nile Virus, they could remove a business card from the brochure (the card had contact information of campus physicians involved in the detection/prevention of West Nile virus). Actual behavioral responses were analyzed using a categorical measure coded 0 (no card removed), 1 (card removed).

**Perceived risk.** Participants’ perceived risk for developing the illness was assessed by a scale combining the statements “How likely do you think it is that you would catch the illness?” and “How likely do you think it is that you would not catch the illness?” (reverse-coded) (Rothman et al., 1999). Ratings on both statements were made on a seven-point scale ranging from 1 (not at all) to 7 (extremely). The combined scale had good reliability (α = 0.81).

At the end of the study, all participants were given a handout with accurate information about the West Nile Virus from the CDC web site as part of debriefing.

**Results**

**Mood induction**

Mood was assessed by the statements “At this moment I feel:” on three bi-polar scales: (1 – happy, 7 – sad) (1 – pleasant, 7 – unpleasant) (1 – good, 7 – bad). Because responses on the three mood self-rating scales were highly correlated (r > 0.72), these scales were combined to form a single mood measure (Cronbach’s α = 0.87). The analysis of self-rated mood on the combined scales revealed a significant main effect which indicates a successful mood manipulation. This measure has been previously used by researchers and has been found a valid and reliable measure of mood (Forgas, 1995, 1998, 1999; see Mayer and Gaschke, 1988, 2011 for validity and reliability scores). Participants who listened to the “positive” music (M = 5.74, SD = 0.84), F(1, 288) = 9.74, p = 0.01 felt significantly more positive than those who listened to “negative” music (M = 3.49, SD = 0.76). Participants who listened to the “negative” music (M = 4.85, SD = 0.98), felt significantly sadder than those who listened to the “happy” music (M = 2.81, SD = 1.62), F(1, 288) = 15.86, p = 0.01.

**Hypotheses testing**

H1 and H2 were tested following Judd and McClelland’s (1989) procedure. Negative and positive mood were entered into a regression equation, which used the perceived risk factor as the outcome of interest. In support of the predictions, the more negative the mood, the higher the perceived risk of contracting the disease mentioned in the message (β = 0.31), t(288) = 4.18, p < 0.01, one-tailed. Also, the more positive the mood, the lower the perceived risk of contracting the virus (β = −0.27), t(288) = −5.74, p < 0.01, one-tailed. Thus, both H1 and H2 were supported by data.
H3 was tested using the same data analysis technique. The average of the participants’ scores of the behavioral intention measure was regressed the risk perception scores. Data supported H3. The higher the participants’ perceived risk, the more likely they intended to follow the recommendations provided in the health message ($\beta = 0.32$, $t(288) = 4.04$, $p < 0.01$, one-tailed). A similar regression model was used to test H3 in regards to the other dependent measure, actual behavior (removing the business card). Supporting H3, findings showed that the higher the participants perceived risk, the more likely they were to remove the business card ($\beta = 0.39$, $t(288) = 7.58$, $p < 0.01$).

Testing the mediation hypothesis (H4). If perceived risk indeed mediates the impact of mood on the dependent variables, the direct relationship between them has to become non-significant when perceived risk is entered into the model (Baron and Kenny, 1986). To test this assumption, a mediation analysis was conducted in LISREL. The analysis shows support for H4 (Figure 2 and Table II).

As shown in Figure 2, perceived risk mediated the effect of mood on behavioral intent. The once-significant direct path from mood to actual behavior ($\beta = 0.19$, $t(288) = 2.69$, $p < 0.01$) fell to non-significance ($\beta = 0.12$, $t(288) = 1.01$, $p = 0.179$) when the mediating variable (perceived risk) was entered into the model. The values are standardized $\beta$ coefficients *$p < 0.05$ and **$p < 0.01$ (Figure 3 and Table III).

As shown in Figure 3, perceived risk also mediated the effect of mood on actual behavior. The once-significant direct path from mood to actual behavior ($\beta = 0.27$, $t(288) = 3.06$, $p < 0.01$) fell to non-significance ($\beta = 0.15$, $t(288) = 1.22$, $p = 0.153$) when the mediating variable (perceived risk) was entered into the model. The values are standardized $\beta$ coefficients *$p < 0.05$ and **$p < 0.01$. Thus, the proposed mediation model was supported for both dependent variables, behavioral intent and actual behavior.

Further analysis
Further analyses revealed no significant interaction effects between mood and health message frame (prevention, detection). For positive mood and message frame, $b = -0.09$, $t(288) = -0.50$, $p = 0.51$, and for negative mood and message frame,

![Figure 2. Mediation results on behavioral intent](image)

<table>
<thead>
<tr>
<th>Model</th>
<th>Standardized coefficients</th>
<th>$t$</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>$\beta$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived risk</td>
<td>0.32</td>
<td>4.04</td>
<td>0.001</td>
</tr>
</tbody>
</table>
This shows that mood effects held regardless of message frame. Exploratory analyses of the interaction patterns above indicated that the strengths of the relations under both types of messages were similar (Figure 4).

**Discussion**

Understanding how pre-existing mood influences the way in which audiences respond to health messages is important both theoretically and practically. The present paper finds support for the proposition that the pre-existing mood of an audience shapes its responses to health PSAs. The influence of mood was mediated by the perceived risk of contracting the disease mentioned by the message. More specifically, personal estimations of risk were found to mediate the impact of pre-existing audience mood on behavioral intent and actual behavior. The more negative one’s mood, the more likely one was to see oneself at risk of contracting the disease mentioned in the message and the more likely one was to adopt the precautionary behavior recommended by the health PSA. Conversely, the more positive one’s mood, the lower the perceived risk and the lower the scores on behavioral intent and actual behavior measures. The results held for prevention as well as detection-framed messages.

In practical terms, the findings suggest a technique by which campaign managers can use message placement to maximize the effectiveness of health communication campaigns. The impact will be likely increased if messages are placed in editorial contexts which induce negative mood. Such contexts include news reports of dramatic events, popular crime dramas like CSI or criminal minds, crime investigation reports, etc. By contrast, environments which induce positive mood (such as popular sitcoms) may decrease the impact of health PSAs. This strategy is particularly easy to implement in online environments. On web sites like Hulu.com or xfinity.com, which have become the preferred TV watching environment for today’s young adults, media planners can easily target individual shows which are known to induce negative mood.

In addition, when a health issue is discussed on radio, music inducing a positive or a negative mood could be played in the background. Also, if the intended audience

### Table III.

<table>
<thead>
<tr>
<th>Model</th>
<th>Standardized coefficients</th>
<th>$t$</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>$\beta$</td>
<td>0.39</td>
<td>7.58</td>
</tr>
<tr>
<td>Perceived risk</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

$b = 0.10$, $t(288) = 0.69$, $p = 0.13$. This shows that mood effects held regardless of message frame. Exploratory analyses of the interaction patterns above indicated that the strengths of the relations under both types of messages were similar (Figure 4).
is presented with messages about a health issue in a controlled environment like an informational session held in a health center or clinic, marketers can manipulate environmental factors which induce negative mood. Such factors include background music, decorations or color schemes in order to maximize the effectiveness of the session. Thus, potential implications for practitioners extend beyond media placement techniques to situations when marketers can manipulate ambient mood.

The negative consequences of positive mood observed in the present study are convergent with the previous finding that negative mood is more beneficial than positive mood in terms of impact on health risk perceptions. Keller et al. (2002) asked participants to estimate personal health risks for breast cancer, followed by positive/negative mood induction. Afterwards, participants were presented with objective risk information about the disease. Negative mood participants adjusted their initial risk estimates closer to the objective data, but positive mood participants did not. The authors concluded that positive mood has detrimental effects on personal health risk perceptions. Extending those findings, the present study provides further evidence that positive mood may be detrimental to health persuasion when the desired message effects are contingent on accurate estimations of personal health risk, this time by unfavorably biasing perceptions of risks communicated in a health PSA.

Figure 4.
People in a positive mood perceived the message as less risky and people in a negative mood perceived the message as more risky regardless of how the message was framed.

Effectiveness of health PSAs
On a theoretical level, the finding, that positive mood lowers perceptions of vulnerability to personal health risks, is particularly informative for research on “optimistic bias”. That literature finds that positive mood makes people believe that they are less at risk than others to experience negative events. However, it has been recently noted that “it is unclear whether positive moods generate optimistic bias by lowering the perceived personal risk, by increasing the risk estimates for others, or both” (Helweg-Larsen and Shepperd, 2001). What the present data suggests is that positive mood may cause optimistic bias when it comes to personal health issues by lowering perceptions of personal risk.

To our knowledge, the relationship between mood and perceptions of health risks has not been examined in the context of exposure to health PSAs. Previous studies describing the relationship between mood and perceptions of health risks were either correlational (operationalizing mood as a trait) or were not concerned with message effects (Salovey and Birnbaum, 1989; Abele and Hermer, 1993). By showing for the first time that the effectiveness of health communication is changed by pre-existing audience mood through the proposed mediation path, the present study makes a potentially important contribution to health communication research. Importantly, the effects were observed for two types of health messages frequently examined in the health literature: prevention and detection appeals. Because prevention or detection appeals make up the vast majority of health messages used in real-life health campaigns (Rothman et al., 1999), the findings may be valuable for developing real-life theory-based health campaigns.

The current study provided new insights of theoretical and practical value by integrating health communication research with recent risk analysis scholarship on the role of mood in risk perception, as well as with literature from advertising and marketing. Thus, the report implicitly shows the value of interdisciplinary approaches in expanding domain specific knowledge, an argument of particular relevance for the health communication domain.

To our knowledge, this is the first experimental test of the role of risk as a mediator of pre-existing mood on responses to health PSAs. The need for health marketing scholars to engage in experimental research has been previously outlined by reviewers of the health campaign scholarship. For example, Brewer et al. (2004, p. 130) explicitly stated that “experimental tests of predicted relations are much simpler to interpret [than correlational data], but they are surprisingly rare in health behavior research”.

That said, it must be acknowledged that experiments have important methodological limitations. Among those limitations is that one should exercise caution in generalizing the findings beyond the conditions of the particular context in which the relationships were tested. For example, the noted effects may or may not generalize beyond the population represented by the sample of undergraduates used in the study. The role of an experiment is to show that, under the strictly controlled environment of the experiment, the hypothesized effects can occur, and not to make generalizations about how strong the effects are “in the real world” or how often they may be observed (Lynch, 1982; Mook, 1983; Kardes, 1996). The latter questions are best answered as experimental data accumulates and a body of knowledge is built observing the effects across different populations or circumstances. Thus, replication is needed with different health topics, mood-inducing techniques and subjects before the effects noted here can be generalized to other health marketing contexts.
Furthermore, as is the case in social sciences in general, attempts at generalization should also consider the conceptualization and operationalization of the variables used in the study. The present study endorsed the most common conceptualization of mood in communication research, one which implies “that the most relevant component of mood states for persuasive impact is the position of mood on the single continuum ranging from negative to positive affect” (Hullett, 2005, p. 425). However, some have conceptualized mood as a bi-dimensional construct, characterized by valence and arousal as two orthogonal factors, and have successfully decoupled the effects of arousal from valence (Shapiro et al., 2002). Because no theoretical reasons indicated arousal might play a role in the present study, arousal was not measured. The present mood manipulation technique likely created medium-level arousal; further research is needed to elucidate if and how the present findings generalize to low levels of arousal. Along the same lines, it has been recently noted that perceived risk has been operationalized in the literature as either perceived likelihood or probability of contracting an illness (which is the case in this study), perceived severity of that disease, and even perceived personal susceptibility of developing the condition compared to others (as in constitutional vulnerability: “Do you get the flu easier than other people?”), which can be high even in likelihood of contracting it is low (Brewer et al., 2007). More research is needed to elucidate if the reported effects of mood generalize to the other two dimensions of perceived risk.

The detrimental effects of positive mood observed in the present research may not be observed in situations when positive affect is needed as a resource for processing the information contained in the message. For example, Das et al. (2012) found that positive mood may facilitate persuasion when the PSAs contain highly self-threatening health information. In their study, smokers were able to process a self-threatening anti-smoking message only when experiencing positive (but not negative) mood, because positive mood served as a buffer allowing people to deal with the negative implications of processing the self-threatening message. Those findings support the mood-as a resource hypothesis (Raghunathan and Trope, 2002) and outline that positive mood can be in that regard beneficial as an antecedent of exposure to health communication.

Finally, research on mood, impulsivity and self-regulation suggests that future studies could explore other facets of the relationship between mood and risk in health persuasion, than the propositions examined here. In non-health domains, negative mood has been shown to induce detrimental, impulsive choices by lowering self-regulation. For example, in a fictional lottery game, people whose negative mood reduced their ability to engage in effective self-regulation favored high risk betting options in spite of the high costs of failing, simply because the bet was associated with the (slim) possibility of a high reward (Leith and Baumeister, 1996). It would be worth to examine if negative mood would determine individuals who already suffer from a health condition to respond favorably to health messages which advocate high risk, high benefit treatment options over messages which promote low risk, low benefit options. Such research would be different from the present study in that it would examine the impact of mood on preferences for differentially risky health treatments. By contrast, the present study found mood effects on subjective estimations of risk of infection among participants not contaminated with the disease. It would be informative if the research would test whether the negative mood effects were due
to decrease in self-regulation, as opposed to mood influence on subjective probability. Furthermore, researchers could ask if the relevance of the topic of the communication to one’s self-conceptions is a possible moderator. Indeed, negative mood effects can be due to increased self-focused attention (Salovey, 1992). Because health issues are usually central to one’s self, while lottery games are not, the effects could be stronger when the messages contain health information than in non-health communication domains.

References


Further reading


About the authors
Sela Sar, PhD is an Associate Professor of Advertising in the Greenlee School of Journalism and Communication at Iowa State University. His research focuses on the impact of mood and emotion on memory and risk communication effectiveness. His work has been published in *Psychology and Marketing, Journal of Advertising, Journal of Marketing Communications, Journal of Current Issues and Research in Advertising* and *Journalism and Mass Communication Quarterly*.

George Anghelcev, PhD is an Assistant Professor of Advertising in the College of Communications at Penn State University. His research focuses on the role of emotion and motivation as determinants of consumer responses to persuasion campaigns. He is interested in social marketing and non-commercial advertising in the areas of health and environmental communication. His work has been published in *Journalism & Mass Communication Quarterly, Psychology & Marketing* and *Journal of Marketing Communications*. George Anghelcev is the corresponding author and can be contacted at: gua4@psu.edu

To purchase reprints of this article please e-mail: reprints@emeraldinsight.com
Or visit our web site for further details: www.emeraldinsight.com/reprints