

# EFFECTS OF EMOTIONAL STATE ON REACTIONS TO HEALTH FEEDBACK

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The influence of emotion on reactions to a subsequent emotion-inducing event, receiving health feedback, was investigated. 208 male and female undergraduate students were given a film emotion induction procedure intended to elicit happiness, sadness, or neutral affect. They then received false feedback indicating that their risk of getting a fictional type of influenza was high or low. Reactions to the feedback were assessed by measuring affect, risk perceptions, and worry. In addition, intentions to engage in health behaviors and actual health information-seeking behavior were assessed. Receiving high risk feedback resulted in less positive affect, more negative affect and worry, and higher risk perceptions than getting low risk feedback. Risk feedback influenced one measure of behavioral intentions. For low risk participants, experiencing an emotion (happy or sad) resulted in taking more pamphlets than those in the neutral condition who received the same feedback. High risk participants who experienced an emotion took fewer pamphlets than neutral people receiving the same feedback. Increased positive affect, worry, and risk perceptions after receiving feedback predicted intentions to engage in health behavior, and people who worried more were more likely to take pamphlets about the flu. However, these reactions to feedback did not mediate the relationship between feedback and behavior. Behavioral intentions did mediate the relationship between feedback and placing contact information in a box to receive more information about the flu. Overall, the

findings have implications for how potentially threatening personal feedback will be interpreted and acted upon depending on the receiver's emotional state at the time of getting feedback.

## TABLE OF CONTENTS

PREFACE.....	ix
1.0 INTRODUCTION.....	1
1.1 EMOTIONAL REACTIONS TO FEEDBACK.....	1
1.2 EFFECTS OF AN INITIAL EMOTIONAL STATE ON REACTIONS TO A NEW EMOTION-INVOKING EVENT.....	3
1.3 THE CURRENT STUDY AND HYPOTHESES.....	9
2.0 METHOD.....	12
2.1 MANIPULATION PILOT TESTING.....	12
2.2 MAIN EXPERIMENT.....	14
3.0 RESULTS.....	22
3.1 ANALYSIS PLAN.....	22
3.2 MANIPULATION CHECKS.....	23
3.3 TESTING HYPOTHESES 1 AND 2 – REACTIONS TO RISK FEEDBACK IN THE PRESENCE OF EMOTION.....	25
3.4 TESTING HYPOTHESIS 3 – RELATIONSHIPS BETWEEN FEEDBACK AND BEHAVIOR AND REACTIONS AND BEHAVIOR.....	27
3.5 TESTING HYPOTHESIS 4 – REACTIONS AS MEDIATORS OF FEEDBACK – BEHAVIOR RELATIONSHIP.....	30
3.6 ADDITIONAL ANALYSES.....	31

4.0	DISCUSSION.....	33
	REFERENCES.....	41

## LIST OF TABLES

Table 1. Mean (Standard Deviation) Perceived Absolute and Comparative Risk Perceptions for Pilot Test Risk Percentage Scenarios.....	50
Table 2. Logistic Regression Results for Emotion (Happiness, Sadness, Neutral) x Risk (Low, High) Analysis with Taking Pamphlets as DV.....	51
Table 3. Odds Ratios for Each Condition for Emotion (Happiness, Sadness, Neutral) x Risk (Low, High) Analysis with Taking Pamphlets as DV.....	52
Table 4. Logistic Regression Results for Emotion (Emotion, Neutral) x Risk (Low, High) Analysis with Taking Pamphlets as DV.....	53
Table 5. Odds Ratios for Each Condition for Emotion (Emotion, Neutral) x Risk (Low, High) Analysis with Taking Pamphlets as DV.....	54

## LIST OF FIGURES

Figure 1. Predicted mediation model.....	55
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## PREFACE

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## 1.0 INTRODUCTION

A woman is on her way to her physician's office for an appointment during which she will get medical test results. Presumably she will react differently depending on whether the results are positive or negative. What if on the way to the office she is pleasantly surprised by a phone call from a close friend? Or, alternatively, what if she gets a call that leaves her feeling down? Could the emotion caused by the phone call influence the woman's reaction to her test results? The study reported here investigated the effects of incidental emotion experienced prior to receiving health feedback on subsequent affective reactions, judgments, and decisions related to the feedback.

### 1.1 EMOTIONAL REACTIONS TO FEEDBACK

In general, people experience positive affect in response to positive feedback and negative affect in response to negative feedback. This is true in many domains, such as social standing (Buckley, Winkel, & Leary, 2004; Leary et al., 2003; Swann, Griffin, Predmore, & Gaines, 1987) and task performance (Jussim, Yen, & Aiello, 1995; Woo & Mix, 1997). In some studies, investigators provide positive or negative task performance feedback precisely to induce positive and negative emotions, respectively (Gerrards-Hesse, Spies, & Hesse, 1994; Spering, Wagener, & Funke, 2005; Westermann, Spies, Stahl, & Hesse, 1996). People react particularly strongly to comparative feedback in which their standing on one dimension is compared to some other criterion. An individual's standing on a dimension can be compared to some objective

standard (e.g., a national guideline), or to another person's or a group's standing on the same dimension (e.g., the average score on an exam). Studies of the latter type of feedback show that people are more pleased and less anxious when they get positive feedback (regardless of whether it is absolute or comparative) as compared to negative feedback (Klein, 2003a), even when an objective comparison criterion is available (Klein, 1997).

Similar reactions to feedback occur in the domain of health. Fries, Bowen, Hopp, and White (1997) found that when participants were given false feedback about the amount of fat in their diet compared to national intake guidelines, those told their diets were high in fat were less calm and content, and more distressed, nervous, sad, and surprised than those told their diets were low or moderate in fat. Similarly, college students told they had borderline high cholesterol experienced more distress, sadness, and surprise and less elation, contentedness, and calm than did students with normal cholesterol levels (Croyle, Sun, & Louie, 1993). McBride et al. (2000) presented smokers with true information regarding whether they lacked an enzyme whose absence has been associated with increased lung cancer risk. Smokers lacking the enzyme reported more fear immediately upon learning of the enzyme absence and at two-month follow-up as compared to smokers with the enzyme. Another study showed that women who had an abnormal mammogram felt anxiety and worry, even after cancer had been eliminated as a possible diagnosis (Lerman et al., 1991). Other research has found that receiving positive health feedback in the form of a "normal" test result on an ovarian cancer screening test resulted in higher positive affect over the course of a four-month study compared to a matched control group that did not undergo screening (Gaugler, Pavlik, Salsman, & Andrykowski, 2006).

Comparative feedback is also important in the health domain. People pay close attention to how their health risk compares to that of others, and being told that one's percentage of

calories from fat is above average results in more worry and increased intentions to reduce risk by making dietary changes than being told that one's intake is below average (Klein, 2003b). Similarly, participants told that their risk of causing a car accident was above average were more disturbed by this information and expressed greater intentions to take precautions (e.g., wearing a seatbelt) when driving than did people told their risk was below average (Klein, 1997).

These findings show that any form of positive and negative feedback may result in positive and negative affect, and comparative risk feedback is especially likely to influence future behavior. The relevant research has been conducted in both laboratory and naturalistic settings, and both actual and false feedback have been used in these studies. Although affect has been explored as a dependent variable in many feedback studies, the role of affect that is present prior to the receipt of feedback has not been systematically explored.

## 1.2 EFFECTS OF AN INITIAL EMOTIONAL STATE ON REACTIONS TO A NEW EMOTION-INVOKING EVENT

Given that people experience various emotional states throughout the course of a day that can each influence feelings, thoughts, and actions, the consequences of one emotion acting in concert with another must be explored. Being in an initial emotional state could influence people's affective reactions to a new emotion-invoking incident, such as receiving health feedback, in a variety of ways. For example, one emotion may affect the magnitude of the emotional reaction produced in response to the incident. The resulting emotional state could then affect subsequent cognitions, including risk perceptions and worry, and behavior, such as health protective actions and information-seeking.

*Effects of an emotional state on a subsequent emotional state.* Support for the idea that emotions can influence the nature and magnitude of subsequent emotional states comes from theory and research on cognitive appraisal patterns and emotions (e.g., Lazarus, 1991; Roseman, Antoniou, & Jose, 1996; Smith & Ellsworth, 1985). Lerner and Keltner (2000, 2001) proposed an appraisal tendency framework showing that experiencing an emotion can cause a person to appraise subsequent situations in line with the cognitive appraisals typical of the original emotional state. Recently, researchers have speculated and found some support for the notion that experiencing one emotion followed by another emotion with conflicting appraisal patterns can result in the minimization of affect (Winterich, Han, & Lerner, 2008). For example, it has been found that anger is associated with appraisals of personal control, and sadness with appraisals of situational control (Smith & Ellsworth, 1985). In preliminary work by Winterich and colleagues (2008), inducing anger followed by sadness “blunted” self-reported experience of sadness, meaning that the difference between reported sadness post-anger induction and post-sadness induction was smaller than when sadness was preceded by neutral affect. The researchers also reported that in a subsequent study, experiencing sadness followed by anger resulted in blunted reported anger when compared to people experiencing neutral mood before anger. Following the logic that conflicting appraisal patterns may lead to minimizing reported affect, the converse outcome is plausible. More specifically, experiencing one emotion followed by another with a similar appraisal pattern may enhance the affective experience.

Additional research addresses the question of how one emotional state can affect emotional reactions to a new event. Zillmann (1971; 1978; 1996) proposed and has found some support for his theory of excitation transfer. He postulates that sympathetic activation or “excitation” from one situation takes time to dissipate, and as long as residual excitation is still

present, it can “transfer” to another situation after the initial event triggering the excitation has subsided. Zillmann specifically predicts that the persisting excitation can enhance subsequent affective experiences, strengthening the intensity of the experience. Classic experiments have created excitation through physical exercise or sexual arousal, assessing the effect of the excitation on subsequent emotion and behavior, such as aggression (e.g., Zillman, Katcher, & Milavsky, 1972; Zillmann & Sapolsky, 1977).

Positive and negative emotional experiences have both been associated with varying levels of sympathetic activation (see Cacioppo, Berntson, Larsen, Poehlmann, & Ito, 2000 for review), and thus emotion is a candidate for creating excitation that may carry over to enhance subsequent emotions. Some research has already investigated this possibility. Zillmann, Mody, and Cantor (1974) found that viewing an arousing emotional film clip (either a hedonic clip of a sexual encounter or a clip of a brutal physical assault) influenced participants’ perceptions of a character’s feelings in a subsequent negative film featuring an arguing couple. Sadness ratings were higher when the initial film clip was arousing compared to when it was non-arousing. Other research shows that excitation associated with a negative emotion, anxiety, enhanced sexual arousal compared to people who were neutral prior to viewing the sexually arousing stimulus (Hoon, Wincze, & Hoon, 1977). Zillmann’s findings lead to the somewhat counterintuitive prediction that an initial emotional event of any valence can increase the intensity of the emotion experienced after a subsequent emotion-provoking event, although in some cases, “hedonic compatibility” effects have been found such that experiencing an emotion followed by another of similar valence results in maximizing the emotional experience (e.g., Zillmann, Bryant, Comisky, Medoff, 1981; Zillmann, Mody, & Cantor, 1974). Zillmann (1996) admits that such hedonic compatibility needs to be further explored. The research in which

hedonic compatibility effects are found aligns with the previously discussed findings of Winterich et al. (2008) that emotions with differing appraisals can result in the blunting of affect and with the prediction that matching appraisals can result in increased affect. Excitation transfer has been demonstrated in the enhancement of aggression and other affective variables, but no research has investigated how the excitation associated with emotional states can influence reactions to subsequent feedback.

*Effect of an emotional state on subsequent cognition.* Research and theory support the notion that an emotional state can also affect cognition. Johnson and Tversky (1983) found that negative mood resulted in increased risk perceptions for a variety of negative events, and positive mood diminished perceived risk for the same events. Similarly, Salovey and Birnbaum (1989) found that sad participants who considered negative future events judged the probabilities of the events as being more likely than did happy participants.

In his Affect Infusion Model (AIM), Forgas (1995) proposed that when making judgments, people can use one of four processing methods – direct access of previous judgments, motivated processing when pressured to render a particular judgment, heuristic processing when trying to exert minimum effort, and substantive processing when interpreting new and often complex information to make a judgment. Using either heuristic or substantive processing methods can result in the infusion of affect into judgments. When processing heuristically, affect can become a source of information factored into a judgment. The use of a systematic processing strategy can result in affect-priming such that one's affective state influences the types of items retrieved from memory that are then used for making judgments. Systematic processing is predicted to occur when judging a new, complex, or personally relevant target and when no specific motivation (other than accuracy) is present. It is notable that these factors

(with the exception of accuracy motivation, as people may want to defend against threatening information) are likely to be present when receiving feedback about oneself. Additional research shows that sadness is often associated with systematic (or substantive) processing, and happiness and anger are associated with heuristic processing strategies (Bless, Bohner, Schwarz & Strack, 1990; Bodenhausen, Kramer, & Susser, 1994; Bodenhausen, Sheppard, & Kramer, 1994).

As was discussed previously, Lerner and Keltner's (2000, 2001) work on an appraisal tendency framework shows that the cognitive appraisals associated with one emotional experience may carry over to influence the appraisal of new situations. For example, anger, with its accompanying appraisals of certainty and control (Smith & Ellsworth, 1985), results in lower, more optimistic risk estimates for a variety of negative events. Similarly, fear, an emotion associated with appraisals of uncertainty and lack of control (Smith & Ellsworth, 1985), results in higher, more pessimistic estimates (Lerner, Gonzalez, Small, & Fischhoff, 2003; Lerner & Keltner, 2001). According to Smith and Ellsworth (1985), sadness, like fear, is associated with uncertainty and lack of control, and happiness, like anger, is associated with certainty and control, so similar risk estimate patterns are expected.

Further supporting the influence of affect on risk judgments is research on the notion of "risk as feelings" (Loewenstein, Weber, Hsee, & Welch, 2001) and the affect heuristic (Slovic & Peters, 2006; Slovic, Peters, Finucane, & MacGregor, 2005). Loewenstein and colleagues propose a dual process model of deliberative and experiential thinking (similar to that proposed by Epstein, Lipson, Holstein, & Huh, 1992) when making judgments (including risk perceptions), and experiential thinking is believed to be influenced by affective factors rather than probabilistic information. The affect heuristic refers to the way that people associate affect with stimuli to varying degrees, and these affective associations are used to construct judgments



(Finucane, Alhakami, Slovic, & Johnson, 2000; Slovic et al., 2005). Although both approaches focus on the affect associated with the target of the risk judgment, it is conceivable that affect from a previous situation could alter the emotional experience. Indeed, the only study looking at the influence of two contiguous emotions showed that experiencing sadness followed by anger, two emotions with conflicting appraisal patterns, resulted in less optimistic risk perceptions than when anger was preceded by neutral affect (Winterich et al., 2008).

Risk perceptions can clearly be affected by emotional states. Most of this research has looked at the role of trait affect or induced affect on risk perceptions but not the occurrence of two temporally close emotions. The proposed study will attempt to replicate the findings of earlier research and to show that happy participants perceive their risk as lower than sad participants do. The relationship between perceived risk and behavioral intentions will also be explored to replicate the finding that risk perception predicts intentions and behavior (e.g., Brewer et al., 2007; Weinstein et al., 2007).

*Effects of an emotional state on subsequent worry.* Worry has also proven to be an important construct involving both affective (e.g., distressed feelings) and cognitive components (e.g., ruminating thoughts), predicting intentions to engage in self-protective behavior such as cancer screening, flu vaccination, and seatbelt use (Chapman & Coups, 2006; McCaul & Mullens, 2003; Zajac, 2007). For example, Zajac (2007) found that participants who were induced to worry about the flu expressed greater intentions to get a flu shot relative to a control group. Receiving positive feedback is expected to result in less worry, whereas receiving negative feedback will result in increased worry and intentions. Prior affect will indirectly affect intentions to the degree that it enhances emotional responses to feedback.

*Behavioral intentions and behavior.* In addition to the reactions described above, intentions to engage in health behavior and actual information-seeking behavior have real-world consequences for health. Health messages that result in more fear cause more behavior change than do low fear appeals (Witte & Allen, 2000), and so both intentions and behavior are predicted to be affected by feedback such that high risk feedback will result in greater intentions and behavior than low risk feedback. Prior affect may indirectly affect behavior by influencing reactions to the feedback, so reactions to feedback may mediate the relationship between feedback and behavior. Because intentions predict behavior (Ajzen, 1985; Ajzen, 1991; Ajzen & Fishbein, 1975; Fishbein & Ajzen, 1975), they will also be tested as mediators.

### 1.3 THE CURRENT STUDY AND HYPOTHESES

Although some research already explores the relationships among an emotional state and subsequent affect, cognition, and behavior, these relationships clearly need to be more fully explored. Research showing that feedback (in health or other domains) can result in strong emotional responses has often been conducted in a relatively isolated manner. Prior affect may be statistically controlled in these studies, but only two studies (Winterich et al., 2008) have systematically manipulated prior affect to explore changes in emotional responses. The work of Zillman and colleagues and preliminary studies by Winterich and others supports the idea that contiguous emotional experiences act in concert with each other such that later emotional experiences are influenced by earlier ones. Zillman's work has often had the goal of investigating aggression and other states of arousal without focusing on the influence of specific emotions. No research has investigated the role of prior emotion in how people respond to feedback about themselves. The current experiment fills these gaps by creating one emotion and

investigating its effect on a subsequent emotional experience, namely receiving feedback about one's own health; this allows the richness of a real world feedback experience to be better captured in the context of the controlled laboratory environment. The study also attempts to replicate previous findings linking emotions, risk perceptions, worry, and behavior.

In this initial investigation, a 3 x 2 between-groups experiment was conducted to explore the role of prior affect and reactions to feedback. Happiness and sadness, two basic emotions that are often used to represent more general positive and negative affect and that have different cognitive appraisal patterns, or neutral affect were first induced. Participants were subsequently given false positive (low risk) or negative (high risk) feedback about the likelihood of their experiencing a fictitious health problem. Affective reactions, worry, perceived risk, behavioral intentions, and information-seeking behavior were assessed after the receipt of feedback. The following hypotheses were tested:

*Hypothesis 1:* Receiving high risk health feedback will result in more negative affect, less positive affect, more worry, and increased risk perceptions when compared to receiving low risk feedback.

*Hypothesis 2:* Experiencing an emotion and feedback of similar valence and appraisal patterns will result in stronger reactions compared to people initially experiencing neutral affect. More specifically, experiencing happiness followed by low risk feedback will result in less negative affect and worry, more positive affect, and lower risk perceptions than people experiencing neutral affect before receiving low risk feedback. Similarly, experiencing sadness followed by high risk feedback will result in more negative affect and worry, less positive affect, and higher risk perceptions compared to people initially experiencing neutral affect before the high risk feedback.

Experiencing an emotion followed by feedback of the opposite valence and appraisal patterns will result in weaker reactions than when the feedback is preceded by neutral affect. More specifically, experiencing happiness followed by high risk feedback will result in less negative affect and worry, more positive affect, and lower risk perceptions than people initially experiencing neutral affect before the same feedback. Similarly, experiencing sadness followed by low risk feedback will result in more negative affect and worry, less positive affect, and higher risk perceptions than people who are neutral before getting the same feedback.

*Hypothesis 3:* High risk feedback will cause greater intentions to engage in health behavior compared to low risk feedback. People receiving high risk feedback will be more likely to engage in information-seeking behavior than those receiving low risk feedback. Also, reactions to feedback (in the form of positive and negative affect, risk perceptions, and worry) will predict behavioral intentions and behavior.

*Hypothesis 4:* The relationship between risk feedback and behavior will be mediated by behavioral intentions and reactions to feedback, including affect, risk perceptions, and worry.

## 2.0 METHOD

### 2.1 MANIPULATION PILOT TESTING

In order to explore the effects of emotion on risk feedback, both emotion induction and risk feedback materials were designed and pilot-tested. To establish clips that result in a neutral affective state, participants (Ps) rated several videos; happiness and sadness videos were not piloted as several reliable clips already exist in the literature (Gross & Levenson, 1995; Rottenberg, Ray, & Gross, 2007). Also, risk percentages of varying magnitude and relative distance from each other were tested to determine which numbers would constitute low and high risk feedback.

#### *Neutral Affect Video Induction Pilot Test*

*Procedure.* Fifteen Ps viewed four documentary video clips on a computer. The videos included a 70s clip about what visitors can expect when visiting an Alaskan national park, a 90s clip about the history of the ruins in Luxor, Egypt, an 88s clip about the founders of the transcontinental railroad, and a 92s clip about how refracting telescopes work. A 20s delay was included between the end of each clip and the instructions for viewing the next clip. After viewing each clip, Ps rated how amused, embarrassed, loving, angry, fearful, prideful, anxious, guilty, sad, confused, happy, shameful, contemptuous, interested, surprised, disgusted, joyful, and unhappy they felt on a scale from 0 (*not at all/none*) to 8 (*extremely/a great deal*) with 4 indicating *somewhat/some*.

*Results.* Descriptive statistics were viewed to determine which clips were most neutral. Following Gross and Levenson's (1995) convention, clips with mean ratings less than 2 for all emotion words were sought. Means ranged from 2.60 to 4.20 for the "interest" item for all clips, but this was not viewed as problematic in that higher interest ratings could illustrate engagement in the video viewing task. Three of the four clips met the qualifications set forth, and the railroad and telescope clips were chosen for use in the study.

#### *Risk Feedback Manipulation Pilot Test*

*Procedure.* Forty-five male and female Ps read six scenarios giving a fabricated average risk and a personal risk percentage that was either higher or lower than average. Both absolute and comparative risk information were given because previous research indicates that comparative risk information can influence judgments and behavior in addition to absolute risk (Klein, 1997), and it was believed that providing both types of risk information would lead to the most impactful risk feedback. Scenarios stated that the average risk was 12% with personal risk percentages of either 1% or 23%, 34% with personal risk estimates of 14% or 54%, and 57% with personal risk of 27% or 87%. Ps rated perceived absolute risk magnitude on a scale from 1 (*very low*) to 7 (*very high*) with 4 indicating *neither low nor high*. Ps also rated how their risk compared to "the average person" on a scale from 1 (*much lower*) to 7 (*much higher*) with 4 indicating *about the same*.

*Results.* A two-way within-subjects analysis of variance (ANOVA) with average risk (12%, 34%, or 54%) and comparative risk (low or high, specific numbers given in previous paragraph) serving as independent variables was conducted. The main effect of average risk number on perceived risk magnitude was significant,  $F(1, 88) = 210.32, p < .001$ , as was the main effect of comparative risk,  $F(1, 44) = 702.63, p < .001$ . The pattern of means for absolute

risk perceptions in Table 1 shows that the higher the average risk, the higher the Ps perceived their own risk in an absolute sense. Being told that comparative risk was low resulted in lower perceptions of risk magnitude than when comparative risk was high. The interaction between average and comparative risk numbers was also significant,  $F(1, 88) = 12.89, p < .001$ , but this interaction was not probed further. A two-way ANOVA was conducted using comparative risk perceptions as the dependent variable. The main effect of average risk number on perceived risk compared to others was significant,  $F(1, 88) = 48.93, p < .001$ , as was the main effect of comparative risk,  $F(1, 44) = 1020.57, p < .001$ . The pattern of comparative risk perception means in Table 1 is similar to the pattern found for the absolute risk magnitude variable. Again, the interaction was significant,  $F(1, 88) = 18.87, p < .001$ , but the interaction was not further explored.

Based on these results, an average risk percentage of 34% with a low risk of 14% and a high risk of 54% was selected for use. The figure of 14% was low in both an absolute and comparative sense, and 54% was considered high. When the average was 12%, both the high and low risk percentages (1% and 23%, respectively) were perceived as low. When the average was 54%, it was thought that the high risk percentage, 87%, might be so high as to be unbelievable.

## 2.2 MAIN EXPERIMENT

### *Participants*

Ps were 208 male and female introductory psychology students at the University of Pittsburgh (67.4% female). All Ps were run individually in one of two quiet rooms containing only two desks, two chairs, and one computer, and they received one credit towards completion of a research participation requirement.

## *Design*

The study was a 3 x 2 between-groups factorial experiment with initial emotional state (*happy/sad/neutral*) and risk feedback (*low/high*) serving as independent variables. Dependent variables are detailed below and include affective reactions to feedback, perceived risk, worry, behavioral intentions, and behavior.

## *Procedure*

*Overview and cover story.* Because labeling emotions can inhibit emotions from carrying over to another situation (Keltner, Locke, & Audrain, 1993; Schwarz & Clore, 1983), Ps were told that they were completing two unrelated studies to make use of the one hour appointment. One study, described to Ps as a study of information processing, served as the emotion induction. The other was a two-part study presented as a study of health risks among college students that was actually intended to allow the presentation of false feedback. The first part of this health risk/false feedback study occurred before the information processing/emotion induction study in order to collect health information that was the basis of the feedback provided later. After the information processing/emotion induction study, the second part of the health risk/false feedback study occurred, and Ps were presented with false feedback that was ostensibly based on the information provided earlier. To make this cover story more convincing, Ps completed separate informed consent forms for each study at the beginning of the session, and materials for each study were formatted slightly differently (e.g., typeset in different fonts). The health risk/false feedback study was administered on paper at one desk, and the information processing/emotion induction study was conducted on a computer at a different desk in the same room.

*Health risk/false feedback study – Part 1.* Ps read an article containing false information about college students' risk factors for a fictitious influenza virus A(H17N8), a subtype of



influenza (flu) that supposedly results in normal flu symptoms such as fever, extreme tiredness, nausea, vomiting, diarrhea, muscle aches, and sore throat (CDC, 2006), as well as chronic fatigue that persists for two years. This health problem was chosen so experimenters could provide believable feedback, and the consequences of getting this type of flu (i.e., experiencing normal flu symptoms and long-term chronic fatigue) resonated with college students.

Ps completed a risk factor questionnaire that they were told could be used to predict their likelihood of getting the specific flu described to them. Some of the questions exhibited high face validity (e.g., “Have you recently been around somebody exhibiting flu-like symptoms such as fever, tiredness, and sore throat?”) to enhance Ps’ perception that their responses could logically be used to determine their personal flu risk. Because a battery of completely face valid questions might have caused Ps to form expectations of their risk and not believe experimenter feedback if it violated their expectations, several other questions (e.g., “How many siblings do you have?”) were not face valid. The risk factor questions varied in controllability so that Ps believed that getting the flu was neither wholly controllable nor uncontrollable. At the end of the questionnaire, Ps rated their absolute risk of getting influenza A(H17N8) on a 7-point scale ranging from 1 (*very slightly or not at all*) to 7 (*extremely*) and a percentage scale ranging from 0% to 100%. They also rated their risk compared to other Pitt students of their age and sex on a scale from 1 (*much lower*) to 7 (*much higher*) with 4 indicating *the same*. Ps gave their questionnaires to the experimenter and then moved on to the information processing/emotion induction study. To minimize the possibility of experiencing anxiety or focusing on risk perceptions in anticipation of feedback (Shepperd, Ouellette, & Fernandez, 1996; Taylor & Shepperd, 1998), Ps were not told that they would receive health risk feedback.

*Information processing/emotion induction study.* Ps were randomly assigned to an emotion (*happy/sad*) or control (*neutral*) condition that determined the emotion that was induced through the viewing of film clips, a highly effective method of emotion elicitation (Gerrards-Hesse et al., 1994; Rottenberg et al., 2007; Westermann et al., 1996). Ps were informed that they would watch two contiguous film clips and that they should “please watch [each] film carefully.” Using this instruction ensures that Ps focus on the task but minimizes the likelihood of demand (Rottenberg et al., 2007). As recommended by Rottenberg et al. (2007) and to assure that all Ps began viewing the induction clip in similar affective states, all Ps watched a neutral 92s clip about how telescopes work (Discovery Education, 2004).

Ps then watched another video clip designed to induce the emotion to which they were randomly assigned. The happiness video was a 155s clip from *When Harry Met Sally* (Reiner, 1989) featuring two characters in a diner discussing women faking orgasms. The sadness induction video was a 171s clip from *The Champ* (Zeffirelli, 1979) that shows a boy watching his father die. For the neutral condition, Ps viewed an 88s documentary clip about the founders of the transcontinental railroad (Zwonitzer & Chin, 2003). The happiness and sadness clips have been validated in a number of studies (Gross & Levenson, 1995; Rottenberg et al., 2007), and the neutral clips were pilot-tested for this experiment (see section 2.1).

Following each film clip, Ps completed a one-page questionnaire in which they recalled the content and settings of the clip to promote the belief that the study was about information processing. Embedded in these questionnaires was a variation of an emotion inventory recommended by Rottenberg et al. (2007) in which Ps were given a list of 18 emotions and asked to “please indicate the greatest amount of emotion experienced for EACH emotion [they] experienced while watching the film” on a scale of 0 (*not at all/none*) to 8 (*extremely/a great*

*deal*) with 4 indicating *somewhat/some*. Ps indicated if they had seen the video clip before and if they looked away from the screen during any portion of the film. The emotion inventory after the first neutral clip served as a baseline emotion measure, and the emotion scale after the second clip was used as a manipulation check. After completing the second questionnaire, the experimenter told Ps that the information processing/emotion induction study was complete.

*Health risk/false feedback study – Part 2.* Ps were randomly assigned to receive low risk or high risk feedback. They were told that while they were participating in the information processing/emotion induction study, the experimenter calculated their personal risk for influenza A(H17N8) based on their questionnaire responses. The experimenter gave Ps a folder containing a one-page feedback sheet. The underlined items in the feedback statement below were handwritten to give the illusion that the experimenter calculated each P's risk and filled it in.

Ps in the positive feedback condition were informed that “A previous study shows that the average Pitt student of your age and sex has a 34% chance of getting influenza A(H17N8) in the next year. Your personal risk of getting influenza A(H17N8) is 14%, which is below average. This means that out of 100 Pitt students with the same risk factors as you, 14 will get influenza A(H17N8) in the next year.” Ps in the negative feedback condition received identical information except that the individual risk was 54%. To more clearly illustrate the risk estimates, Ps in both conditions saw an array of 100 circles (Feldman-Stewart, Kocovski, McConnell, Brundage, & Mackillop, 2000). On one array, 34 circles were filled in to indicate the average Pitt student's risk; the other array illustrated the P's individual risk with 14 or 54 circles, depending on the condition. The feedback sheet also informed Ps that preventive measures like frequent hand-washing, getting an influenza vaccination (flu shot), and taking

antiviral drugs can reduce the risk of getting the flu. When Ps finished reading the feedback, they were given the dependent measures.

*Dependent measures.* Ps completed an emotion inventory modeled after the PANAS (Watson, Clark, & Tellegen, 1988) to assess their emotional state after receiving feedback. On this inventory, they rated how interested, distressed, content, excited, upset, happy, strong, guilty, scared, sad, hostile, enthusiastic, proud, anxious, irritable, alert, surprised, ashamed, inspired, jittery, nervous, determined, attentive, calm, amused, active, afraid, and elated they were “at the present moment” on a 5-point scale (1 = *very slightly or not at all*, 2 = *a little*, 3 = *moderately*, 4 = *quite a bit*, 5 = *extremely*). Ps rated how low or high they thought their risk of getting influenza A(H17N8) was on a 7-point scale with 1 indicating *very low* and 7 indicating *very high*. Risk perceptions were also assessed by having Ps indicate whether they *disagree strongly*, *disagree mildly*, *agree mildly*, or *agree strongly* with the following statements: “I feel that I’m going to get influenza A(H17N8) this year” and “I feel very vulnerable to influenza A(H17N8)”. Ps rated how worried they were about getting influenza A(H17N8) on a 7-point scale with 1 indicating *very slightly or not at all worried* and 7 indicating *extremely worried*.

Ps indicated their intentions to engage in each of five flu-related behaviors including discussing the feedback with a doctor, asking a doctor for antiviral drugs, getting a flu shot, increasing hand-washing frequency, and looking for more information about the flu on a 7- point scale with 1 indicating *very slightly or not at all likely* and 7 indicating *extremely likely* and on a percentage scale with 0% meaning *no chance of performing the behavior* and 100% meaning *definitely performing the behavior*. Ps were also asked to choose *yes* or *no* to indicate whether they would or would not execute the behavior. Perceived difficulty and efficacy of the behaviors were assessed as possible control variables. Ps rated the difficulty of performing each of the

behaviors on a 7-point scale with 1 meaning *very slightly or not at all difficult* and 7 indicating *extremely difficult*. Ps rated their perceived efficacy of getting a flu shot, taking antiviral drugs, and increasing hand washing frequency on a similar 7-point scale. The behaviors were selected because they vary in difficulty and several of the behaviors are actual recommendations for flu prevention (CDC, n.d.). To measure some form of actual behavior, Ps were given the option of placing their name and email address in a box to receive more information on flu and flu prevention. They were also able to select and take home up to five brochures containing accurate information about flu and its prevention and treatment. To eliminate demand effects, Ps were able to engage in these behaviors when the experimenter was not present.

After assessing behavior, several measures were included to assess the effectiveness of the risk manipulation. Ps rated how serious of a health threat they felt A(H17N8) was to them on a 7-point scale ranging from 1 (*very slightly or not at all serious*) to 7 (*extremely serious*). Ps recalled whether their risk was above, below, or the same as average.

*Control and demographic items.* Ps completed a series of items for control purposes. These included items assessing gender, age, race, and the extended form of the PANAS (PANAS-X) used to measure trait affect (Watson & Clark, 1994). Ps were also asked questions related to the frequency with which they perform behaviors related to the dependent variables in the study (e.g., frequency of doctor visits, seeking health information, and hand washing, and flu shot and antiviral medication history).

*Debriefing.* Ps were told that any time they complete more than one study at a time, researchers issue a debriefing questionnaire. On this questionnaire, Ps guessed the purposes of the two supposedly separate studies. They were also asked if they thought there was a connection between the two studies, and if so, what the connection was. If Ps believed there was a

connection, the experimenter verbally probed them to determine if they thought the connection existed before or after being asked the question on the debriefing questionnaire.

Ps underwent a process debriefing procedure (Ross, Lepper, & Hubbard, 1975) to make sure they understood the true nature of the study and the need for deception. They were encouraged to ask any questions they had. Ps were allowed to keep any brochures they took during the health risk/false feedback study, and all Ps were given more information about flu and flu prevention. Lastly, Ps completed a form acknowledging the deception and stating whether or not they gave permission for the use of their data.

### 3.0 RESULTS

All Ps gave permission for their data to be used. Four Ps were eliminated from analyses because they correctly guessed the hypotheses, did not believe the feedback, or surmised a connection between the two studies, and 13 Ps were removed because they received an outdated or incorrect version of materials. Four additional Ps were removed because at the end of the study, they could not correctly recall the risk feedback they were given. These 21 Ps were eliminated from analyses, leaving a final sample size of 187 (67.4% female, 85.0% White, *M* age = 18.89 years). There were 33 Ps in the happy/low condition, 28 in the happy/high condition, 30 in the sad/low condition, and 32 in the sad/high, neutral/low, and neutral/high conditions. Analyses were also conducted including the eight Ps who had either guessed the hypotheses, did not believe the feedback, or could not correctly recall their feedback. All results were the same, with the exception of the effect of risk feedback on behavioral intentions measured on a percentage scale, which was significant (instead of only marginally so) when the removed Ps were included.

#### 3.1 ANALYSIS PLAN

First, manipulation checks of the emotion induction and risk feedback manipulation were performed. Then, analyses of variance (ANOVAs), logistic regression analyses, and multiple regression analyses were conducted to test the hypotheses. Preliminary ANOVAs indicated that potential control variables (i.e., baseline positive and negative affect, baseline risk perceptions,

trait positive and negative affect, health behavior history, and perceived difficulty and efficacy of health behaviors) and demographic items (i.e., age, race) did not differ by condition and thus these variables were not included in analyses. Regression analyses showed that gender did not systematically moderate or explain any of the reported effects and thus are not discussed further. An alpha level of .05 was used for all statistical tests. Ps for whom there were missing data for any variable included in a particular analysis were not included in that analysis, resulting in slightly varying Ns across analyses.

### 3.2 MANIPULATION CHECKS

*Emotion induction.* Both baseline emotions and post-video emotion ratings were assessed. Baseline affect was analyzed after the initial neutral telescope video in order to test the effectiveness of the neutral manipulation. A positive affect factor was created by averaging the ratings for amusement, love, pride, happiness, interest, surprise, and joy ( $\alpha = .79$ ), and a negative affect factor was created by combining ratings of embarrassment, anger, fear, anxiety, guilty, sadness, confusion, shame, contempt, disgust, and unhappiness ( $\alpha = .60$ ). Baseline positive affect was low with means ranging from 1.30 to 1.70, as was negative affect with means of 0.23 to 0.40. Separate two-way ANOVAs showed that there were no differences among the six conditions in baseline positive affect or negative affect,  $F_s < 1.99$ ,  $p_s > .05$ , so baseline affect was not included in any other analyses.

Ps rated 18 emotions after viewing the emotion induction videos so as not to draw attention to the five emotion words that were of interest. Three emotions (amusement, happiness, and joy) were averaged to create a happiness score ( $\alpha = .85$ ), and two emotions (sadness and unhappiness) were combined for a sadness score ( $\alpha = .92$ ). A two-way ANOVA



showed that there was a significant effect of video on happiness scores,  $F(2, 181) = 131.24, p < .001$ . Tukey HSD post-hoc tests indicated that Ps who watched the happy video ( $M = 4.21, SD = 1.86$ ) were more happy than Ps who watched the sad ( $M = 0.66, SD = 1.07$ ) or neutral ( $M = 0.92, SD = 1.10$ ) videos. As expected (because Ps had not yet received risk feedback), there were no significant differences in happiness scores based on risk feedback condition nor was there an interaction between risk feedback and video viewed,  $F_s < 0.58, p_s > .05$ . A two-way ANOVA showed similar results for sadness scores such that there was a significant difference in scores based on video condition,  $F(2, 181) = 317.39, p < .001$ . Tukey HSD post-hoc tests indicated that Ps who watched the sad video ( $M = 5.19, SD = 2.07$ ) were more sad than Ps who watched the happy ( $M = 0.18, SD = 0.72$ ) or neutral videos ( $M = 0.13, SD = 0.35$ ). There was no interaction, nor were there any differences based on risk feedback condition,  $F_s < 0.92, p_s > .05$ . These findings suggest that the emotion induction was successful.

*Risk feedback manipulation.* Perceived risk of getting the flu was assessed on a 7-point scale and as level of agreement with feelings of risk and vulnerability. These items were standardized and had high internal consistency ( $\alpha = .75$ ). They were therefore averaged to create a perceived risk score with higher scores indicating higher perceived risk. It should be noted that the means for Ps in the high risk condition fell above the midpoint on the 7-point item, and between *disagree mildly* and *agree mildly* for the other two items. The means for the low risk condition fell below the midpoint on the 7-point item and between *disagree strongly* and *disagree mildly* for the other two items. A two-way ANOVA using the composite perceived risk measure as the dependent variable indicated that Ps in the high risk condition reported feeling more at risk ( $M = 0.44, SD = 0.73$ ) than Ps in the low risk condition ( $M = -0.43, SD = 0.64$ ),  $F(1, 181) = 73.69, p < .001$ . There was no effect of emotion condition or an interaction between

emotion condition and feedback condition,  $F_s < 0.29$ ,  $p_s > .05$ . This finding suggests that the risk feedback manipulation worked as intended and also supports Hypothesis 1, that higher risk feedback will result in greater risk perceptions.

Ps were also asked how serious of a health threat the flu was to them. Ps in the high risk condition thought the flu was a more serious threat ( $M = 3.67$ ,  $SD = 1.28$ ) than Ps in the low risk condition ( $M = 3.31$ ,  $SD = 1.33$ ),  $F(1, 181) = 3.83$ ,  $p = .05$ . There were no effects of emotion condition nor was there an interaction between emotion and risk feedback,  $F_s < 1.59$ ,  $p_s > .05$ . These analyses provide more evidence that the risk feedback manipulation was successful.

### 3.3 TESTING HYPOTHESES 1 AND 2- REACTIONS TO RISK FEEDBACK IN THE PRESENCE OF EMOTION

To test hypotheses 1 and 2, reactions to feedback (i.e., positive affect, negative affect, risk perceptions, worry) were analyzed. It was expected that there would be a main effect of risk such that high risk feedback would result in less positive affect and worry, more negative affect, and higher risk perceptions (Hypothesis 1). Hypothesis 2 predicted that experiencing prior emotion and feedback of matching valence (i.e., sad/high risk, happy/low risk) would result in stronger responses to feedback when compared to people in neutral conditions receiving the same type of feedback, and it was expected that weaker reactions (compared to neutral) would be experienced if emotion and feedback did not correspond (i.e., happy/high risk, sad/low risk).

*Emotional reactions to feedback.* To measure emotional reactions to feedback, a positive affect (PA) and negative affect (NA) score were constructed from the post-feedback emotion inventory. The 12 ratings given for negative adjectives (distressed, upset, guilty, scared, hostile, irritable, ashamed, jittery, nervous, afraid, sad, anxious) were summed ( $\alpha = .82$ ). Similarly, 13

ratings of positive adjectives (interested, excited, strong, enthusiastic, proud, alert, inspired, determined, attentive, active, happy, elated, amused) were also summed ( $\alpha = .83$ ). Because NA was not normally distributed, it was log-transformed using natural logs (ln). The ln is a monotonically increasing function, so higher values of the ln of NA correspond to more NA than lesser values.

High risk Ps reported experiencing less PA ( $M = 23.84$ ,  $SD = 6.32$ ) than low risk Ps ( $M = 26.57$ ,  $SD = 7.25$ ),  $F(1, 179) = 7.65$ ,  $p < .01$ . Similarly, high risk Ps felt more NA ( $M = 2.77$ ,  $SD = 0.27$ ) than low risk Ps ( $M = 2.66$ ,  $SD = .23$ ),  $F(1, 181) = 10.04$ ,  $p < .01$ . There were no significant effects of emotion condition on either positive or negative affect, nor were there any significant interactions,  $F_s < 1.03$ ,  $p_s > .05$ . Because a main effect of risk was found in the direction expected for both positive and negative affect, Hypothesis 1 was supported. Because emotion condition did not significantly affect emotional responses or moderate effects of risk feedback, Hypothesis 2 was not supported.

*Risk perceptions.* Testing Hypotheses 1 and 2 requires the investigation of risk perceptions in response to feedback. As explained when presenting the risk feedback manipulation checks, Ps in the high risk condition felt more at risk than Ps in the low risk condition, providing support for Hypothesis 1. There was no effect of emotion or interaction of the two independent variables, indicating that Hypothesis 2 was not supported.

*Worry.* Worry about getting the flu as a response to feedback was also investigated in order to further explore Hypotheses 1 and 2. High risk Ps experienced more worry ( $M = 3.73$ ,  $SD = 1.35$ ) than did low risk Ps ( $M = 3.00$ ,  $SD = 1.32$ ),  $F(1, 179) = 13.21$ ,  $p < .001$ , and there was no effect of emotion condition or interaction between the two independent variables,  $F_s < 2.44$ ,  $p_s > .05$ . Hypothesis 1 was supported, and Hypothesis 2 was not.

### 3.4 TESTING HYPOTHESIS 3- RELATIONSHIPS BETWEEN FEEDBACK AND BEHAVIOR AND REACTIONS AND BEHAVIOR

Hypothesis 3 predicted that high risk feedback would increase intentions to engage in and actual engagement in behavior relative to low risk feedback. It was also hypothesized that reactions to feedback would predict intentions and behavior. In order to test these predictions, the relationships between feedback and behavioral intentions and behavior were assessed using ANOVA and logistic regression, respectively. Multiple and logistic regression were also used to test the predicted relationships between reactions to feedback and intentions and behavior.

*Feedback and behavioral intentions.* Intentions to engage in five different flu-related health behaviors were measured on three different scales. The 7-point scale items ( $\alpha = .78$ ) and percentage scale items ( $\alpha = .80$ ) were each averaged to create two separate measures of behavioral intentions. The yes/no choice items did not have sufficiently high reliability and are not discussed further. Risk feedback affected intentions to engage in the health behaviors on both the 7-point,  $F(1, 179) = 4.78, p < .05$ , and percentage scales,  $F(1, 179) = 3.36, p = .07$ . High risk Ps expressed more intentions to engage in behaviors (7-point  $M = 3.41, SD = 1.30$ ; percentage  $M = 40.24, SD = 22.05$ ) than did low risk Ps (7-point  $M = 3.00, SD = 1.20$ ; percentage  $M = 34.43, SD = 19.46$ ). Emotion did not have an effect on intentions, and there were no interactions between emotion and risk,  $F_s < 0.61, p_s > .05$ . Because the main effect of risk was significant at the conventional .05 level for one of the intentions measures, Hypothesis 3 was partially supported.

*Feedback and behavior.* Ps were given the option of taking five different pamphlets with information on flu and flu prevention and of putting their name in a box to receive more information about flu and flu prevention. The number of pamphlets taken was not distributed

normally, so this outcome was coded as a dichotomous variable with 0 indicating that Ps took no pamphlets and 1 indicating that they took at least one pamphlet. Whether or not Ps put their contact information in a box for more information was also treated dichotomously (0 = name not in box, 1 = name in box). The two behaviors were moderately correlated ( $r = .41, p < .01$ ). Two separate logistic regression analyses were conducted using a risk dummy variable (0 = low risk, 1 = high risk), a happiness dummy variable (0 = neutral or sad, 1 = happy), and a sadness dummy variable (0 = neutral or happy, 1 = sad) as predictors, and one of the dichotomous behavior variables as the dependent variable.

For the first analysis, the dependent variable was pamphlets taken. Coefficients associated with the risk variable, sadness dummy variable, and interactions of both risk and sadness and risk and happiness were all significant (see Table 2 for Bs, ORs, CIs, and p values). The positive coefficient for the risk variable indicates that high risk Ps were more likely to take pamphlets than low risk Ps. The positive coefficient for the sad dummy variable indicates that sad Ps were more likely to take pamphlets than neutral Ps. A similar interpretation of the happy dummy variable can be made (although this variable was not significant). More importantly, these patterns were qualified by the significant interactions of happiness and risk and sadness and risk indicating that emotion moderated the effects of risk. The coefficients for the interaction terms were negative and of similar magnitude to the risk variable, indicating that the influence of risk is minimized by the presence of emotion.

To further explore this interaction, ORs for each condition were obtained by substituting the proper values for the predictors and using the resulting logit to obtain the OR (see Table 3). Neutral/high risk Ps were most likely to take pamphlets (though the OR = 1.00 indicates that they were equally likely to take them as to not take them), and neutral/low risk Ps were least

likely to take pamphlets, as shown by  $OR = 0.19$ . Ps in all other conditions were more likely to take pamphlets than neutral/low risk Ps and less likely to take than neutral/high risk Ps, suggesting that experiencing an emotion made Ps less sensitive to the risk feedback.

A similar analysis was conducted using the same independent variables and whether or not Ps placed their name in the box as the dependent variable. Risk was the only significant predictor, and high risk Ps were more likely to put their name in the box than low risk Ps ( $OR = 2.48$ ,  $95\% CI = 1.15 - 5.35$ ,  $p < .05$ ). There were no effects of emotion or interactions of risk and emotion ( $ps > .05$ ).

*Reactions to feedback and behavioral intentions and behavior.* In order to test whether or not reactions to feedback predicted behavior and intentions (Hypothesis 3), regression analyses were conducted entering post-feedback positive and negative affect, worry, and risk perceptions simultaneously as independent variables. Multiple regression analyses were conducted for the behavioral intentions variables, and logistic regression analyses were conducted for the dichotomous behavior variables. Analyses were repeated with only significant predictors, and the standardized regression coefficients ( $\beta$ s) or odds ratios (ORs) are reported below.

For the 7-point behavioral intentions measure, both positive affect ( $\beta = .22$ ,  $t = 3.62$ ,  $p < .001$ ) and worry ( $\beta = .53$ ,  $t = 8.73$ ,  $p < .001$ ) were significant predictors, indicating that increases in positive affect or worry were associated with increased intentions to engage in health behaviors. Similarly, positive affect ( $\beta = .24$ ,  $t = 3.85$ ,  $p < .001$ ) and worry ( $\beta = .39$ ,  $t = 5.09$ ,  $p < .001$ ) predicted the percentage measure of behavioral intentions in the same direction. Perceived risk was also a significant predictor ( $\beta = .16$ ,  $t = 2.15$ ,  $p < .05$ ), and increased risk perceptions were associated with greater intentions to perform health behaviors. The finding that several

reaction variables (positive affect, worry, and risk perceptions) predicted behavioral intentions provides partial support for Hypothesis 3.

Worry (OR = 1.44, 95% CI = 1.14 – 1.81,  $p < .01$ ) was the only significant predictor of the taking pamphlets variable, indicating that Ps who were more worried were more likely to take pamphlets than less worried Ps. None of the reaction variables predicted whether or not Ps put their name in the box for more information. The finding that worry was associated with one of the behaviors (taking pamphlets) provides partial support for Hypothesis 3.

### 3.5 TESTING HYPOTHESIS 4 – REACTIONS AS MEDIATORS OF FEEDBACK – BEHAVIOR RELATIONSHIP

Hypothesis 4 predicted that reactions to feedback and intentions would mediate the relationship between risk feedback and behavior. Mediation analyses were conducted according to the steps recommended by Baron and Kenny (1986) to test the mediation model pictured in Figure 1 and predicted in Hypothesis 4. This model predicts that reactions to feedback (i.e., positive affect, negative affect, worry, risk perceptions) and behavioral intentions mediate the relationship between risk feedback and behavior. Each potential mediator was tested separately. Because the predictor variables and potential mediators were continuous and the outcome variables were dichotomous, the coefficients were transformed before conducting Sobel tests of significance of mediated effects (Herr, n.d.; Kenny, 2008; MacKinnon & Dwyer, 1993; Sobel, 1982). Neither the reaction variables nor behavioral intentions mediated the relationship between risk feedback and taking pamphlets. Sobel tests indicated that behavioral intentions mediated the relationship between risk feedback and putting a name in the box for more information (7-point intentions:  $t = 1.99$ ,  $p = .05$ ; percentage intentions:  $t = 1.74$ ,  $p = .09$ ).

### 3.6 ADDITIONAL ANALYSES

Examining the patterns of means for the behavior dependent variables revealed that Ps in the happy and sad conditions might have differed from those in the neutral condition, but not from each other. For this reason, ancillary analyses were conducted to explore whether the distinction between experiencing an emotion and experiencing no emotion is an important one. For these analyses, two-way ANOVAs were conducted comparing only Ps in the happy and sad conditions on the continuous dependent variables, and no differences were found,  $F_s < 1.60$ ,  $ps > .05$ . There were no significant interactions of the emotion variable and risk feedback,  $F_s < 1.69$ ,  $ps > .05$ , and the main effect of risk still held for the positive affect, negative affect, risk perception, and worry dependent variables,  $F_s > 4.20$ ,  $ps < .05$ . Logistic regression analyses show that there were no effects of the emotion variable, risk feedback condition, or interactions of the two on either of the dichotomous behavior variables,  $ps > .05$ .

Because the happy and sad conditions did not differ, Ps in either of those conditions were combined into an “emotion” group, which was then compared to the neutral condition with two-way ANOVAs. These ANOVAs showed that a main effect of risk occurred for positive affect, negative affect, risk, worry, behavioral intentions (both 7-point scale and percentage scale),  $F_s > 4.08$ ,  $ps < .05$ . There were no effects of the emotion variable,  $F_s < 1.32$ ,  $ps > .05$ , or interactions of risk and emotion,  $F_s < 1.70$ ,  $ps > .05$ .

Two logistic regression analyses were conducted using a risk dummy variable (0 = low risk, 1 = high risk) and an emotion dummy variable (0 = neutral, 1 = happy or sad). Whether or not Ps took pamphlets or put their name in the box for more information was coded as before. Risk was the only significant predictor of whether or not Ps put their name in the box. High risk



Ps were more likely to put their name in the box than low risk Ps (OR = 2.45, 95% CI = 1.14 – 5.28,  $p < .05$ ). There were no effects of emotion or interactions of risk and emotion ( $ps > .05$ ).

Analyses show that there were significant effects of risk, emotion, and their interaction for the variable assessing whether or not Ps took pamphlets (see Table 4 for Bs, ORs, CIs, and p values). The positive coefficient for the risk variable indicates that high risk Ps were more likely to take pamphlets than low risk Ps. The positive coefficient for the emotion variable indicates that Ps experiencing an emotion were more likely to take pamphlets than neutral Ps. These patterns were qualified by the significant interaction between risk and emotion, which indicated that emotion moderated the effects of risk. The coefficient for the interaction term was negative and of similar magnitude to the risk variable, confirming earlier findings that the influence of risk is minimized by the presence of emotion.

To explore this interaction, ORs for each condition were again obtained by substituting the proper values for the predictors and using the resulting logit to compute the OR (see Table 5). The ORs for neutral/high risk and neutral/low risk Ps were the same as before. Ps in both the emotion/low risk and emotion/high risk groups were more likely than neutral/low risk Ps and less likely than neutral/high risk Ps to take pamphlets, confirming that experiencing an emotion made Ps less sensitive to the risk feedback.

## 4.0 DISCUSSION

The study presented here was conducted in order to explore the effects of emotion on reactions to health feedback. Hypothesis 1 predicted that receiving high risk feedback would result in more negative affect and worry, less positive affect, and higher risk perceptions than receiving low risk feedback. Analyses showed that this hypothesis was entirely supported and that reactions to high and low risk feedback were clearly differentiated in the way expected. Hypothesis 2 predicted that experiencing an emotion followed by risk feedback of similar valence would result in stronger reactions (positive and negative affect, risk perceptions, and worry) as compared to participants whose risk feedback was preceded by neutral affect. Similarly, it was predicted that experiencing emotion and feedback that were not of the same valence would result in weaker reactions when compared to neutral people getting the same type of feedback. Hypothesis 2 was unsupported in that emotion did not affect any of the reaction variables or moderate the effects of risk feedback.

Though it is not clear why Hypothesis 2 was not supported and why emotion had no effect on reactions to feedback, several possibilities exist. The emotion induced by the film clips was relatively mild, and it is possible that the magnitude of emotional reactions to the risk feedback dominated the effect of previous emotional states. Contributing to this potential explanation is the inclusion of a manipulation check after viewing the emotion induction film clips. Completing the emotion inventory may have resulted in participants consciously attributing their emotions to the film clips, minimizing the effect of emotional experience on

subsequent judgments (Keltner et al., 1993). The manipulation check was included to ensure that the clips induced the target emotion in light of the fact that the neutral clips had not been used previously, but in the future, it would be better if only a subsample of participants complete emotion manipulation checks.

Hypothesis 3 predicted that feedback would affect behavioral intentions and behavior and also that reactions to feedback would predict behavioral intentions and health information-seeking behavior. Feedback affected behavioral intentions, though one of the measures was only marginally significant. Feedback also affected an information-seeking behavior – taking pamphlets – such that participants in the neutral condition were most likely to take pamphlets if they were at high risk and least likely to take them if they were at low risk. Participants who experienced happiness or sadness were less sensitive to risk than neutral participants, making them less likely to take pamphlets than neutral/high risk participants and more likely to take them when compared to neutral/low risk participants. Feedback and emotion did not affect the other emotion variable – placing one’s name in a box to receive more information. There are two probable reasons for this null finding. First, participants may have felt that taking pamphlets immediately provided a sufficient amount of information (explaining the moderate, not high, correlation between the two behavior variables) and eliminated the need to receive more information later. Secondly, not putting their name in a box may merely be a reflection of the student participants’ desire to finalize their participation and minimize future contact with research staff.

Providing additional support for Hypothesis 3 is the finding that some reaction variables (positive affect, worry, and risk perceptions) predicted intentions such that an increase in reactions resulted in greater intentions to engage in health behavior. Experiencing more worry

resulted in participants being more likely to take informational pamphlets about flu and flu prevention, but no reactions predicted the likelihood of participants putting their name in a box to receive more information. The finding that increased positive affect, increased worry, or higher perceived risk could result in greater intentions suggests an inverted-U shaped relationship between negative reactions and feedback behavior such that mid-level positive affect and negative reactions (i.e., worry and perceived risk) could result in greater intentions to engage in behavior than low levels of positive affect and high levels of negatively valenced reactions (i.e., worry and perceived risk) or high positive affect and low negative reactions. It is also possible that people experiencing positive affect endorsed health behaviors as a method of mood maintenance, and people experiencing worry or feeling at risk endorsed the same behaviors as a plan to minimize their risk and the negative thoughts accompanying it.

Hypothesis 4 predicted that reaction variables would mediate the relationship between risk feedback condition and behavior. None of the reaction variables served as mediators, but behavioral intentions mediated the relationship between risk feedback condition and giving contact information to receive more information about the flu. Neither the reaction variables nor the intentions variables mediated the relationship between risk feedback and likelihood of taking pamphlets. Intentions may not have affected pamphlet-taking behavior because the intentions measure was a composite measure of self-reported plans to engage in several health behaviors, not a specific measure of intentions to take pamphlets. The previous findings about the relationship between risk feedback and reactions and intentions suggest that risk feedback affects resulting emotion, worry, and risk perceptions, which in turn affect intentions. These intentions then drive information-seeking behavior.

Ancillary analyses for which there were no *a priori* hypotheses indicated that there were no differences between the behavior of happy and sad participants in response to feedback. Participants experiencing any emotion behaved differently than participants who were in a neutral state. More specifically, it was confirmed that participants experiencing any emotion and told they were at either high or low risk were more likely to take pamphlets than neutral/low risk participants and less likely to take them than neutral/high risk participants. The reason for this finding is not clear, but some speculation can be made. As mentioned earlier, completing emotion manipulation checks may have caused participants to associate their emotion with viewing video clips, minimizing emotion's effect on subsequent judgments (Keltner et al., 1993). Behavior is not a judgment in the same way that reporting emotional reactions or risk perceptions is, and so prior emotion may have had an opportunity to affect it. More specifically, attributing emotion to watching videos may reduce the effect of prior emotion on later self-reports of emotional reactions to feedback because participants may consciously feel that the prior emotion is not relevant to the current emotion judgment. Participants may not view the prior affect as being related to their behavior and so they may not consciously consider whether or not their affect is relevant to the behavior, allowing prior affect to influence behavior. As discussed earlier, participants who had been happy may have taken pamphlets in order to maintain their affect and feel good about doing something for their health. Sad participants may have been processing more systematically (Bless et al., 1990; Bodenhausen, Sheppard, et al., 1994) and so may have also sought out more information about their health. Neutral participants would have had no need to change their affective state, so they may have focused only on the risk feedback when deciding to take pamphlets or not.

A significant body of research in the risk communication field focuses on giving people more information and accurate information about their risk, but the findings of the study detailed here show that affect unrelated to the feedback situation can alter the way in which people perceive their feedback and how they act as a result. Giving accurate personalized feedback may not be received in the way intended if the recipient is experiencing an emotion. Given that people have limited resources for coping with feedback (both physical and self-regulatory; Muraven & Baumeister, 2000), it could be problematic that if when experiencing an emotion, people with minimal risk are still dedicating resources to reducing an already low risk instead of allocating those resources to pursuits that would be more beneficial to their health.

Other researchers (Winterich et al., 2008) have found that transitions from one emotional state to another depend on appraisals associated with the emotions. The findings in this study did not support such an account as both happy and sad prior affect resulted in similar behavior, and neither emotion influenced self-reported affective and cognitive reactions to a subsequent emotion-inducing event (i.e., receiving feedback). It is possible that receiving health feedback could result in mixed emotions (e.g., simultaneous sadness, fear, and/or anger in response to a positive test result for a disease), leading to mixed appraisals, making it more complicated to predict the influence of a prior emotion on the emotions arising from the feedback.

There are wider implications for giving people different types of positive or negative feedback about themselves. Affect unrelated to the feedback may influence the actions people undertake upon receiving such feedback. For example, receiving feedback about one's social standing while in an affective state might result in allocating too few resources to resolving a severe social conflict (mirroring a high risk situation) or more resources than are really necessary in the case of a milder incident (similar to a low risk situation). Another application could be to

stereotype threat situations. Stereotype threat refers to situations where people (e.g., minority students taking an exam) feel that they are in a situation where they are stereotyped (e.g., the same students being aware that there is a stereotype that members of their minority group are unintelligent) and then are at risk of fulfilling the stereotype (Steele & Aronson, 1995). Such a situation could be considered a “high risk” situation, and experiencing an emotion prior to being exposed to this threatening information might result in students being less successful at using techniques to avoid performing poorly (e.g., affirming the self when in a threat situation; Martens, Johns, Greenberg, & Schimel, 2006) than students in a neutral affective state.

From a methodological perspective, this study makes several contributions. First, truly neutral film clips were established. Other neutral induction clips often induce mild positive affect or feelings of calm or displeasure because the clip is boring (Rottenberg et al., 2007). The finding that experiencing an emotion can influence some subsequent behavior emphasizes the possibility that affect that participants are experiencing upon arrival to the lab could potentially influence manipulations or dependent variables, highlighting the need for researchers to induce neutrality at the beginning of emotion experiments. A contribution was also made in the development of a false feedback paradigm that allows researchers to explore the role of health feedback in the laboratory in a realistic way that does not rely on vignettes or hypothetical scenarios. It is likely that the feedback manipulation was successful because the fictitious health problem was described so that participants would believe that their lives could be affected by the problem. At the same time, the problem was not so severe or scary as to immediately result in defensive processing. Also, the risk estimates given to participants were considered to be high in an absolute sense as well as a comparative sense, confirming findings of a wide body of research showing that absolute and comparative feedback have predictable effects on people’s emotions,

cognitions, and behavior (Buckley et al., 2004; Croyle et al., 1993; Fries et al., 1997; Gaugler et al., 2006; Jussim et al., 1995; Klein, 1997, 2003a, 2003b; Leary et al., 2003; Lerman et al., 1991; McBride et al., 2000; Woo & Mix, 1997).

The current study and its findings yield multiple directions for future research. A logical extension of this work is to explore the role of affect on responses to other types of health information besides risk feedback. Indeed, a project is currently underway to investigate how emotion may affect the interpretation of information and the decisions made by people considering whether or not to enroll in clinical trials. Furthermore, the role of other emotions in influencing reactions to health information could be investigated. Often negative emotions are associated with receiving health feedback, and the effects of fear and anxiety on reactions to feedback could be explored. In the current study, worry, a construct that is simultaneously affective and cognitive, was the only reaction to feedback that predicted behavior. This finding indicates that worry should continue to be explored as a variable distinct from negative affect that may influence health behavior. The possibility that mixed emotional states might be experienced by people prior to receiving feedback as well as afterwards deserves further investigation. Future research might also explore what types of behaviors emotion might be most likely to influence. For example, emotions may be most likely to affect intentions and engagement in behaviors that could reduce negative affect or maintain positive affect.

The findings of this study are of interest to social psychologists as well as researchers from outside of the field studying emotions and reactions to various types of feedback. Receiving high risk feedback results in feeling worse, worrying more, intending to engage in more healthy behavior, and seeking more health information than getting low risk feedback. However, emotion that is experienced prior to getting such feedback can influence the way



people behave. More research needs to investigate how even seemingly innocuous emotional experiences can exert their influence on outcomes of great consequence, such as health behavior.

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Table 1. Mean (Standard Deviation) Perceived Absolute and Comparative Risk Perceptions for Pilot Test Risk Percentage Scenarios

Average Risk In Scenario	Risk Perception	Comparative Risk in Scenario	
		Low	High
12%	Absolute	1.31 (0.51)	3.67 (1.19)
	Comparative	1.67 (0.67)	5.02 (0.75)
34%	Absolute	2.49 (0.92)	5.24 (0.88)
	Comparative	2.00 (0.64)	5.56 (0.94)
57%	Absolute	3.07 (1.03)	6.49 (0.66)
	Comparative	2.18 (0.75)	6.56 (0.50)

*Note.* Ps rated absolute risk magnitude by indicating how low or high they considered their risk on a scale from 1 (“very low”) to 7 (“very high”) with 4 indicating “neither low nor high”. Ps rated comparative risk on a scale from 1 (“much lower”) to 7 (“much higher”) with 4 indicating “about the same”.

Table 2. *Logistic Regression Results for Emotion (Happiness, Sadness, Neutral) x Risk (Low, High) Analysis with Taking Pamphlets as DV<sup>a</sup>*

Variables	B	OR	95% CI	p*
Risk	1.69	5.40	1.66 – 17.56	< .01
Happiness Dummy	0.85	2.35	0.70 – 7.87	> .05
Sadness Dummy	1.55	4.73	1.43 – 15.59	= .01
Risk x Happiness	-1.60	0.20	0.04 – 1.00	= .05
Risk x Sadness	-2.06	0.13	0.03 – 0.60	< .01

<sup>a</sup>N = 187

\*p values are for Wald chi-square test of association.

Table 3. *Odds Ratios for Each Condition for Emotion (Happiness, Sadness, Neutral) x Risk (Low, High) Analysis with Taking Pamphlets as DV*

Emotion Condition	Risk Condition	OR
Neutral	Low	0.19
Happy	Low	0.43
Happy	High	0.47
Sad	High	0.60
Sad	Low	0.88
Neutral	High	1.00

Table 4. *Logistic Regression Results for Emotion (Emotion, Neutral) x Risk (Low, High) Analysis with Taking Pamphlets as DV<sup>a</sup>*

Variables	B	OR	95% CI	p*
Risk	1.69	5.40	1.66 – 17.56	< .01
Emotion	1.20	3.32	1.13 – 9.80	< .05
Risk x Emotion	-1.82	0.16	0.04 – 0.65	= .01

<sup>a</sup>N = 187

\*p values are for Wald chi-square test of association.

Table 5. *Odds Ratios for Each Condition for Emotion (Emotion, Neutral) x Risk (Low, High)*  
*Analysis with Taking Pamphlets as DV*

Emotion Condition	Risk Condition	OR
Neutral	Low	0.19
Emotion	High	0.54
Emotion	Low	0.62
Neutral	High	1.00

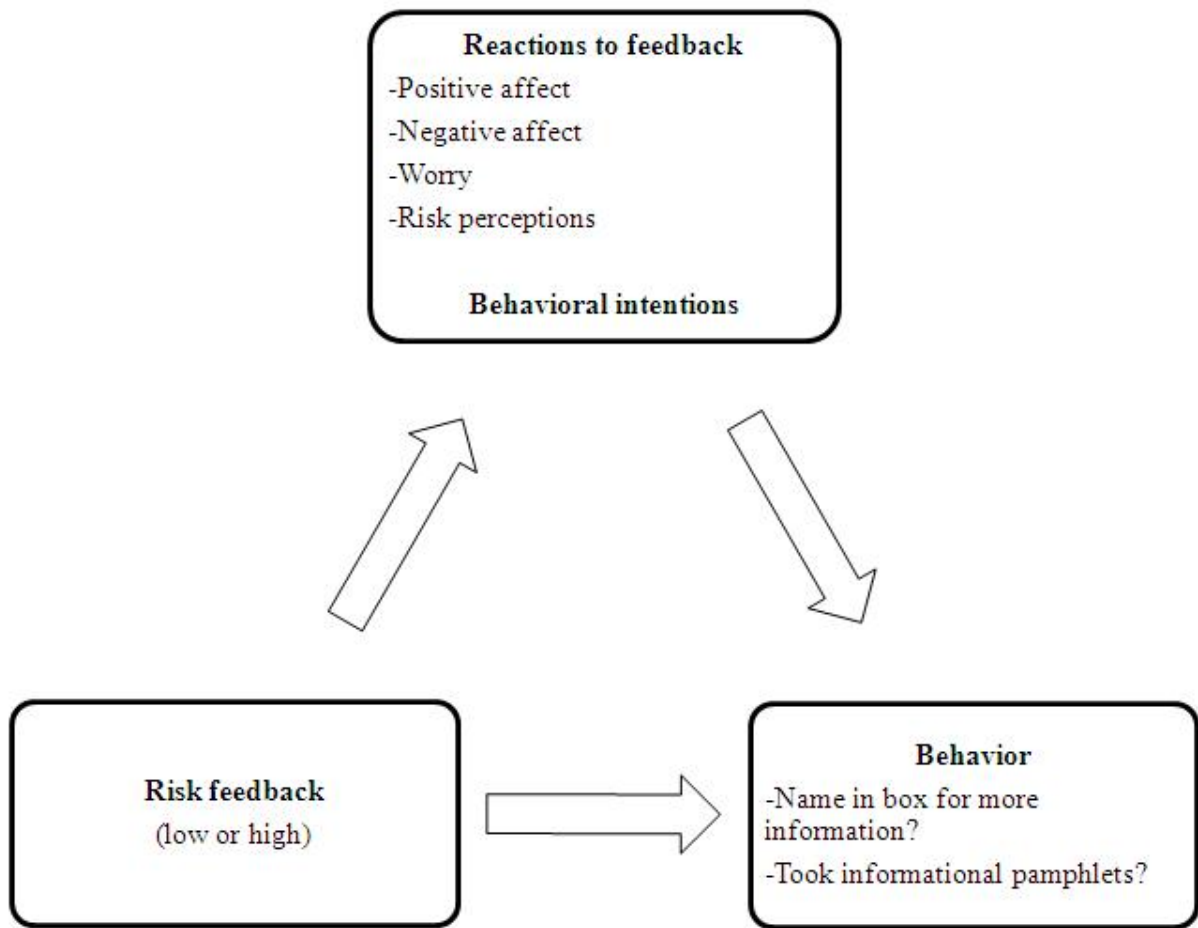


Figure 1. Predicted mediation model.