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the role of emotion regulation in the defensive processing of fear-arousing health-risk information

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The role of emotion regulation in the defensive processing of fear-arousing health-risk

information

by

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Abstract

Individuals often respond defensively to emotive "fear appeals" that target people's unhealthy behaviors and aim to instill motivation for behavioral change. Both classic and contemporary models of defensiveness assume that these defensive reactions allow people to down-regulate the negative emotional experience resulting from the fear appeals (i.e., to feel better about their unhealthy behavior). However, no study to date has directly examined emotional regulatory processes, such as cognitive reappraisal, that may occur during fear appeals. In the present study, female participants' caffeine use and self-rated cancer risk were measured before they viewed a health message about a link between caffeine and ovarian cancer. Implicit state affect was measured during and after the message, and then participants rated their acceptance of the message and their own cancer risk again. Trait reappraisal interacted with reported caffeine use to predict less message acceptance. Evidence for the role of affect in defensiveness was not found.

Chapter I: Defensive Processing

"I must not fear. Fear is the mind-killer. Fear is the little-death that brings total obliteration. I will face my fear. I will permit it to pass over me and through me. And when it has gone past I will turn the inner eye to see its path. Where the fear has gone there will be nothing. Only I will remain." – Frank Herbert, "Dune"

Aspiring to exist in a state of good physical health is an important goal for most people. Regrettably, many individuals have habits and exhibit behaviors that make this goal somewhat challenging to achieve. People use tobacco products, drink excessive amounts of alcohol, eat unhealthy foods that are high in refined sugar and saturated fat, overeat, and overuse stimulants such as caffeine and sugar in order start their day or maintain a certain level of alertness. These behaviors, while common-place and accepted in the modern world, are nonetheless often bad for our physical health, especially in excess. Health professionals and those involved in public policy remind us of this fact constantly at our yearly check-ups, clinic visits, and in preventative advertising campaigns designed to ultimately change our behavior so we may better meet our lofty goal of achieving good physical health. Unfortunately, these campaigns and the information contained in them are rarely sufficient to cause behavioral change (Arthey & Clarke, 1995; Brown, 2001; Cameron & McGuire, 1990).

Barring the physically and mentally addictive properties of many of these behaviors, why do people continue them despite the consistent assault on the public with advertising campaigns often citing strong scientific evidence that they are harmful and presenting dire health scenarios? More specifically, why do people become defensive when faced with threatening information about their behavior in regards to their health?

The current proposal describes a study that will more directly examine health-threat defensiveness, a particular way of responding to threatening health-risk information that reduces the chances of protective behavior. Current models of defensiveness are limited in their predictive power and indicate a lack of understanding of defensive processing due to their lack of attention to affective changes and the role of negative affect more generally. Furthermore, there is a general neglect of the influence that individual differences in affective experience might have on those viewing relevant health information. This proposal focuses on individual differences in emotion regulation style, specifically cognitive reappraisal (Gross, 2002). Who are cognitive reappraisers, and what does having this personality characteristic do to affect defensive responses to relevant health-threat information?

In the following review I will first focus on the concept of fear and its relationship to defensiveness. I will then describe how defensiveness has been measured and how defensiveness to relevant health-threat information has been studied more broadly. I will also focus on studies employing the affect infusion model (AIM; Forgas, 1995) and their relevance to a proper understanding of affect and affective changes during defensiveness. Finally, I will conclude the review by focusing on emotion regulation style, cognitive reappraisal in particular, and how cognitive reappraisal as a personality characteristic might predict increased defensive responding. In the proposed study I will measure defensive responding across a standard defensiveness paradigm (i.e., assess reactions to truthful information about a caffeine and cancer risk) as well as measure affect changes occurring during the presentation of a health-threat (i.e., fear appeal). Critically, individual differences in cognitive reappraisal will be examined as a predictor of affect changes and defensive responding. Examining affect and emotion regulation in particular will provide the defensiveness literature with substantial theoretical insight

regarding underlying emotional processes. Furthermore, these insights should inform interventions aimed at promoting healthier behaviors.

Fear and Defensiveness

Before proceeding, both fear and defensiveness should be defined. In a health context, defensiveness assumes the existence of fear or anxiety in a vulnerable person being exposed to self-relevant information about their risky health behaviors. Fear is a basic emotional state (Ekman, 1984) reflected in high arousal and unpleasant feelings stemming from a sense of perceived risk or danger, whether that risk is real or imagined (Lazarus, 1991; Janis & Feshbach, 1953). Often fleeting, it seems to serve the evolutionary purpose of communicating the existence of danger within groups, as well as preparing the body for action (i.e., flight) in the face of danger (Darwin, 1872; Ekman & Friesen, 1971; Ekman, 1984; Thayer, 1989). Fear dissipates due to the threat causing it being removed or leaving, our conscious efforts to reduce the experience of fear, or automatic regulatory processes. In this way fear is a negative emotion, as the experience of such emotions causes us to adapt in some way to remove the negative state (Thayer, 1996). Anxiety, on the other hand, is a mood state that includes feelings of worry, uneasiness, and dread regarding situations perceived as uncontrollable or unavoidable. To a certain extent anxiety is a normal reaction to stress, and often co-occurs with fear (Ohman, 2000).

Using a process definition, defensiveness in health psychology is defined by avoidant or resistant reactions to threatening health communications (i.e., those that create anxiety or fear) (Leventhal, 1970; Good & Abraham, 2008). This definition of defensiveness leaves open the possibility of many different types of defensive responses. Blumberg (2000) arranges defensive

(in his terminology "avoidant") response types into four broad categories, with examples
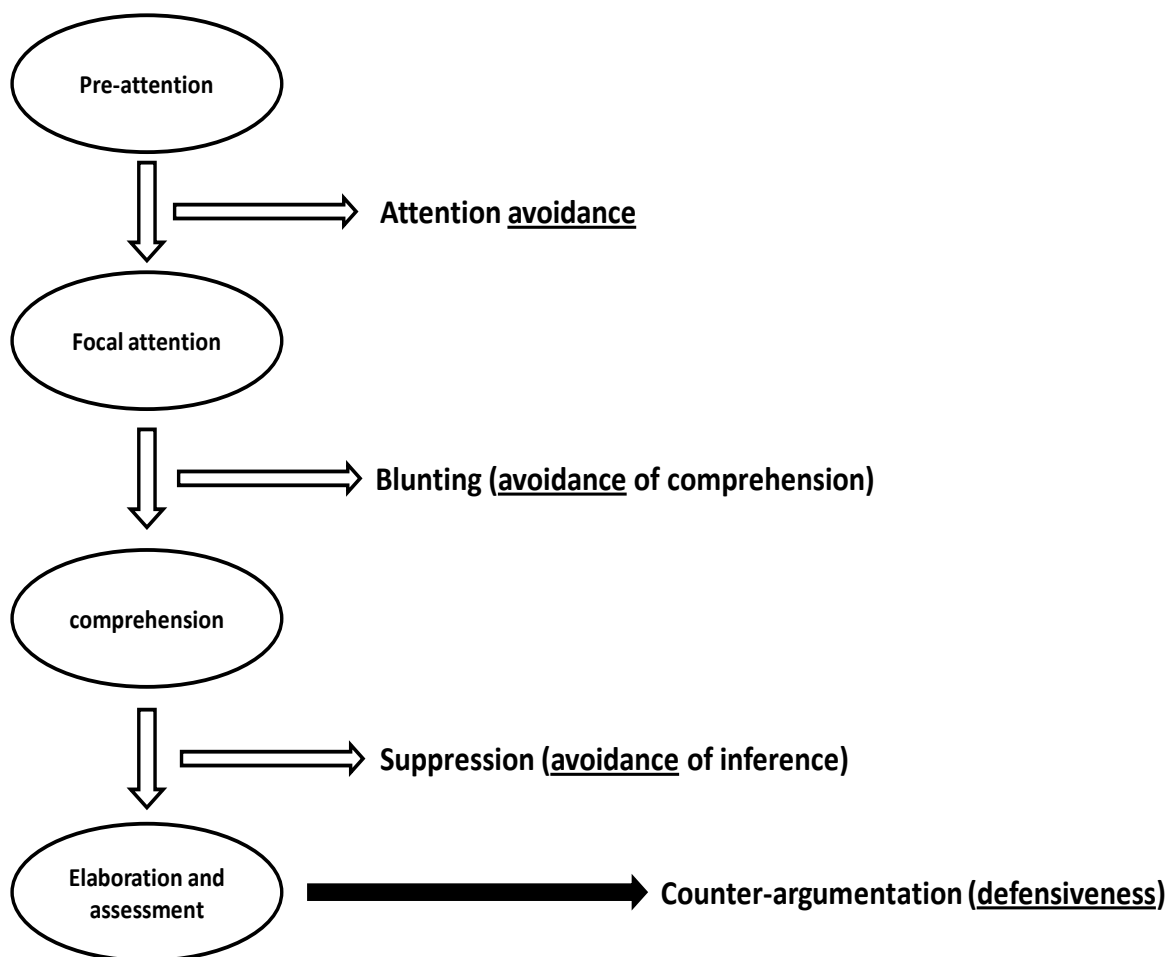
following each (see Figure 1):

Figure 1: An information-processing model of defensive responses. From Blumberg (2000).

1. Attention *avoidance*: typically due to focusing on something else, a person is unable to begin to notice a message as the message is not able to draw sufficient attention

2. Blunting, or *avoidance* of comprehension: in this situation, the message has drawn sufficient attention, but the viewer of the message is able to distract himself, i.e., the message is attended to but not processed

3. Suppression, or *avoidance* of inference: the message is attend to by the viewer and comprehended at some level, but the viewer does not infer or apply the message to his particular status or situation

4. Counter-argumentation (*defensiveness*): the message is attended to, comprehended, and an appropriate inference is considered, but the message viewer argues against the validity of the inference

My consideration of defensiveness will include responses that fit the last two categories only and thus require that attention has been paid to the message, some level of comprehension has occurred, the viewer has considered the message relevant to his own situation or status, and thus may defensively modify the meaning of the inferences he or she is making. These defensive response possibilities include increased belief that a particular health-threat is more prevalent, a lack of message acceptance, and reductions in perceived severity or susceptibility to the threat (Good & Abraham, 2008). The broad concept of information avoidance (in Blumberg's model attention and comprehension avoidance), is defined as any behavior designed to prevent or delay the acquisition of available but potentially unwanted information (Sweeny, Melnyk, Miller, & Shepperd, 2010). Again, defensiveness for the purpose of this proposal implies that the incoming information was attended to and handled in some way. As indicated, this handling can take various forms including derogation of the incoming information ("those people don't know what

they're talking about!"), or even seeking personal exceptions to the information ("this can't happen to me!").

Critically, people who are at the highest risk for the negative consequences described in the health communication often fail to increase their personal risk estimates relative to those people who are at a lower risk (Brown, 2001). This is a key consideration in defensiveness, though other types of defensive responding such as avoiding personal implications or counter-arguing the message can also be problematic. Failure to increase relative personal risk estimates, however, is critical as it implies that defensive people will not take the necessary protective action to reduce the risk thus making risk underestimation a rather direct indicator of defensiveness. The reduction of actual risk by changing behavior requires an accurate perception of an increased risk to cause a person to intend and be willing to make a behavioral change (Brewer et al., 2007; Gibbons, Gerrard, Blanton, & Russell, 1998).

The defensive processing of fear-appeals has received an exceptional amount of attention in the health and social psychology fields. For about 60 years, researchers have examined the impact of so-called "fear-arousing" communications in health promotion advertisements (de Hoog, Stroebe, & de Wit, 2007; Good & Abraham, 2008; Hovland, Janis, & Kelly, 1953; Janis & Feshbach, 1953; Job, 1988; Leventhal, 1970;). Fear-arousing communications emphasize the negative consequences of health-impairing behaviors to motivate individuals to change these behaviors. For example, a fear-arousing television commercial whose aim is to decrease the incidence of drunk driving might display vivid images of charred bodies, or provide statistics about traffic incidents involving drunk drivers to create fear in the viewer in order to be attended to and presumably remembered. These advertisements typically focus on the negative consequence of drunk driving – injuring yourself or others while driving in an impaired

state – as opposed to focusing on the positive outcome of not driving drunk – arriving home at the end of the night safely. The reason for using the former approach is fairly apparent: the sight of a burnt corpse splattered on a highway next to the twisted wreckage of a vehicle is more memorable than the sight of a family sedan pulling gently onto a driveway without a scratch.

Research studies examining fear-arousing communications have demonstrated an inconsistent pattern of results based not only on the design of the studies in question, but also on the level of fear employed in the communication (Brown, 2001; Janis, 1967; Job, 1988). Fear-arousing health-risk communication is memorable, but does not always elicit behavioral change – the goal of such communication. In fact, studies have demonstrated that fear appeals are likely to induce defensive fear responses which reduce the likelihood of protective action being taken, most likely because those who are most at risk are likely to show the most defensiveness given the higher level of experienced fear (Brown & Locker, 2009; Reed & Aspinwall, 1998). Regrettably, due to the resulting difficulty viewers experience in ignoring communications such as these among the constant media bombardment of the day (due to their vividness), they seem here to stay.

The experience of the negative emotion of fear or associated anxiety during threatening health-risk advertisements presents a conundrum. As previously mentioned, on one hand a fear appeal message's presentation (e.g., a burning body) will likely be remembered. On the other hand, the fear may cause veritable knee-jerk reactions where the information, "don't drink and drive," is less likely to be endorsed and acted upon. This reaction is, again, defensiveness, a presumed effort to down-regulate the negative emotion brought on by the fear-appeal in the advertisement.

How can we be confident that people's reactions to health information reflect defensiveness in any given context? In a meta-analysis of defensiveness research, Good and Abraham (2008) examined studies in which the standing on a given risk factors (e.g., smoking) was examined as a potential predictor of increased defensive responding to risk-relevant information, as well as studies where interventions involving factors such as participants' personal efficacy or self-affirmation were examined as a factor potentially reducing defensiveness. The first type of study, risk-factor relevance, examines differences in two groups that should differ in relevance of health information. For example, Liberman and Chaiken (1992) compared those who did and those who did not drink coffee in order to examine if standing on this factor created differences in motivation to arrive at a particular conclusion regarding the presentation of a possible link between caffeine intake and breast disease. The other category of intervention factors, for example, exposed participants to efficacy interventions in which the salience of their ability to change the risky behavior putting them at risk being described to them was manipulated. To the extent people reject the health communication when it is more relevant to them (or when they lack the efficacy to change their behavior), we may infer that defensiveness is occurring as a means with coping with the health threat (Blumberg, 2000).

Modeling Defensive Processing

Models of defensiveness processing of threatening self-relevant health-risk fear appeals assume that a person will have a negative emotional experience as a result of viewing the self-relevant health-risk information (de Hoog, Stroebe, & de Wit, 2007; Witte, 1994; Janis, 1967; Levanthal, 1970; Rogers, 1975, 1983). This negative emotional experience, and how people process it, plays a critical role in defensiveness. Leventhal (1970) argues that protective adaptive behavior, or "danger control", stems from attempts to respond to the purely cognitive assessment

of danger or threat, not from attempts to control the immediate negative emotions created by fear appeals. Therefore, assuming people are able to overcome the initial negative affect, they are likely to focus on the cognitive impact of the message. Protective adaptive behavior, danger control, is a result of an adaptive response to the actual cognitive meaning of the threat or danger (Witte, 1992; Leventhal, 1970; Rogers, 1975). For example, if a cigarette smoker sees a health advertisement describing the dangers of smoking, applies the message to his own behavior, and then subsequently throws his cigarettes in the garbage and purchases nicotine gum and patches in the drugstore across the street, that person is attempting to actively solve the problem which should remove any fear. The smoker has accepted the message, applied it to himself, and is taking active steps to reduce the level of danger and as a result, fear. Otherwise, if people are unable to move beyond the negative affect they are experiencing, their focus remains purely emotional and likely results in "fear control" – defensiveness. When people are unable to cope with the negative emotion of fear as employed by a fear appeal, they engage in fear control. Fear control *is* effectively accomplished via defensive processes. Leventhal's model, however, is rather vague in that it merely posits broad cognitive processes under which fear or danger control is likely to be enacted, rather than offering more concrete predictions based on situational factors regarding threat or personality differences in emotional processes.

The Stage Model. Following Leventhal's reasoning, de Hoog, Stroebe, and de Wit's (2007) stage model predicts defensiveness in a more concrete manner. Defensive responding (i.e., fear control) is thought to only occur when the perceived impact of the health threat is highly *severe* and the person viewing the threat feels highly *vulnerable*. The three other possible combinations of perceived severity and vulnerability produce what de Hoog and colleagues (2007) term "accuracy motivation" where the person viewing the information is more likely to

attempt to accept the actual information contained in the advertisement, or, as Leventhal (1970) would call it, experience the full cognitive impact of the message. Since highly vulnerable people who are at risk of very severe consequences are the primary people these health advertisements are attempting to reach, the prediction of defensiveness under conditions of high risk and high severity is a problem for public health campaigns. In this meta-analysis, de Hoog and colleagues' (2007) stage model, which integrates the aforementioned classic models and work of Hovland (1957), Janis (1967), Levanthal (1970), and Rogers (1975), seems somewhat successful in predicting defensive responses based on its two factors of severity and vulnerability. To further understand the predictions of the stage model, the extended parallel process model (Witte, 1994), an aptly named extension of Leventhal's parallel process model, must also be examined.

The Extended Parallel Processing Model. Witte's (1994) extension of the parallel process model differs from Leventhal's only in the respect that more specific predictions of "when" and "why" are made. In the extended parallel process model, a person's behavioral efficacy is the primary additional factor that gives it additional predictive power. The extended parallel process model states that fear appeals can be successful *only* when the individual cares about the situation and only if they feel they have the agency (i.e., efficacy) to deal with the threat. When presented with a message that employs fear to create motivation to change behavior, individuals seek to control their emotional response in one of two ways: by employing danger control or fear control. Danger control is the preferred method of control, and is the response that fear appeals are attempting to elicit from the target population. In this danger control process, the individual seeks to reduce the risk presented through direct action and adaptive changes. Reduction of risk (and associated fear) is caused by protection motivation and enabled by response efficacy, which is the perception that an effective response is available and will remove the threat. In the fear

control process, the individual focuses primarily on the emotional impact of the risk being presented, disregarding or modifying the meaning of the presented risk. On the other hand, fear control's goal is to reduce the anxiety the risk has created through means other than adopting adaptive resolutions as in danger control. Fear control, then, as has been stated, requires defensiveness.

Fear control, the frequent result of highly emotive advertisements that draw heavy attention to the negative consequences of the behavior being described (instead of the positive outcome of the efficacious actions that can be taken to avoid the risk) is often maladaptive. In the extended parallel process model (Witte, 1994), fear control results in defensive processing under conditions of high perceived severity, high perceived vulnerability, and low perceived efficacy. This is similar to the stage model (de Hoog et al., 2007), except in its two factor form, the stage model simply *assumes* low efficacy under conditions of high vulnerability.

There is an important theoretical omission in both the stage model and the extended parallel process model. Both models, taken together, somewhat adequately predict defensive processing and its outcomes. But, outside of the assumption that the factors involved have emotional precursors, neither model explicitly examines the process of how the necessary down-regulation of emotion occurs. This theoretical "black-hole" – failing to account for the role of affective processing in defensiveness – leaves a gap in our understanding of defensiveness. This gap can be informed by examining related literatures regarding affect and emotion regulation. Accordingly, examining Forgas' affect infusion model (AIM; Forgas, 1995) should serve to shed more light on these processes. Together with a consideration of emotion regulation processes (Gross, 2002), a more targeted look at the nature of dynamics between emotion and cognition should allow for a deeper understanding of the processes involved in defensiveness.

Chapter II: Affect in Defensiveness

Affect Infusion

Forgas (1995) describes affect infusion as "the process whereby affectively loaded information exerts an influence on and becomes incorporated into the judgmental process, entering into the judge's deliberations and eventually coloring the judgmental outcome". To demonstrate the most basic tenet of the model, consider a simple study that was conducted at Target stores. Positive, neutral, or negative mood was randomly induced in employees by giving them similarly positive, neutral, or negative comments about the store and the store's customer service rating. Next, their helping behavior towards a customer requesting assistance in locating a non-existent book was assessed. Employees in a positive mood were more helpful than those in a negative mood (Forgas, Dunn, & Granland, 2008). In its simplest form, the AIM predicts that people use their current mood to make decisions about subsequent situations. More importantly, the affect infusion model further predicts that people are more likely to use their current mood for information as the situation becomes more complex.

The most important part of the affect infusion model for our consideration of defensiveness appears to be the AIM's prediction that negative affect promotes a systematic, accommodative processing style (Fiedler & Bless, 2001). The experience of negative affect seems to reduce the tendency to use perceived familiarity as an indication of truthfulness, thus promoting skepticism, and for our purposes, increasing defensiveness. Recall that defensiveness is often conceptualized as rejecting scientific information or indicating skepticism concerning the credentials of the information being presented to them. In one recent study, for example, people in a negative mood were more likely to be skeptical of a video-taped person's proclamation of innocence regarding a theft (Forgas & East, 2008).

In relation to defensiveness, the AIM makes predictions about the success of persuasive communication. Viewing positive affect as a resource, Trope, Gervey, and Bolger (2003) found that feeling "good" allows people to overcome defensiveness when faced with personally relevant weakness-focused information about their abilities. This has a direct application to defensiveness theory as it has been stated previously that defensiveness models generally assume that fear, a negative emotional state, precedes defensive responding. Additionally, only when negative feedback, which we might consider similar to a personally relevant health-threat fear appeal, is deemed useful and constructive do people consider overcoming the negative emotional cost of acting on the feedback (Gervey & Trope, 1998). This is important because it also confirms Witte's extended parallel process model hypothesis that efficacy plays an important role in overcoming defensiveness. Finally, from the AIM's perspective of affect as a resource, *positive* mood was found to enhance the effect of counter-attitudinal messages on individuals' memory and attitudes when those messages were relevant to the self (e.g., high-level caffeine consumers), but less so when the messages were not relevant to the self (e.g., modest to low-level caffeine consumers) (Raghunathan & Trope, 2002). Again, this provides evidence that it is a necessity in current and future defensiveness studies to examine mood and affective states, as will be done in this proposed study, to better understand defensiveness beyond the base predictions of current models.

To briefly summarize the discussion so far, defensiveness to health-risk information in fear appeals is most likely to occur when a person believes they are vulnerable to the presented risk, that the risk is severe, and that they do not possess the efficacy to change the behavior. People presumably demonstrate defensive behaviors as means of controlling the negative affect created during the fear appeal. As an outcome of this attempt, people fail to adequately modify

their risk perceptions in line with their personal level of vulnerability. Affective processing seems clearly at work in defensiveness (Forgas & Smith, 2008; Trope et al., 2003; Raghunathan & Trope, 2002), and the implications of the affect infusion research indicate that examining affective changes in conjunction with defensive response measurements would provide a better picture of what exactly is occurring during defensiveness, and why it is occurring.

Emotion Regulation

Given the assumed regulatory nature of defensiveness as well as the demonstrated importance in examining affective states throughout the process of exposure to relevant health-threat information, it is critical to examine emotion regulation strategies that are employed by people facing unpleasant, highly emotive situations such as emotive fear-appeals. Gross (2002) has termed the ongoing process of properly regulating one's emotions as emotional self-regulation, or just emotion regulation. People desire to regulate their emotions more so when a negative rather than a positive emotion is being experienced (Gross, Richards, & John, 2006; Heilman et al., 2010). This regulation can occur at any time during an emotion generative process. An emotion generative process (Figure 2) consists of a person engaging in a situation, paying attention to it, appraising the situation, and then having an emotional response to it. People can take any of the following five general actions during this generative process in order to regulate their emotions. They can engage in:

1. situation selection (avoid the situation in the first place)

2. situation modification (actually change the situation)

3. attentional deployment (change what aspects are attended to)

4. cognitive change (cognitive reappraisal of the situation)

5. response modulation (emotional suppression of the response)
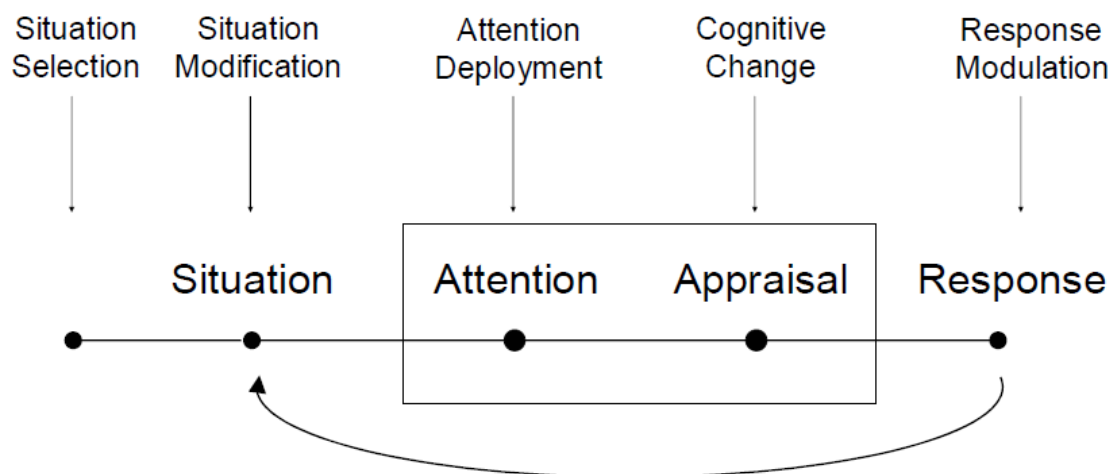
Figure 2: A process model of emotion regulation highlighting the five general
categories of emotion regulation strategies. From Gross and Thompson (2007).

These actions are Gross' (2008) general categories of emotion regulation strategies. The

first three occur at or before the attentional stage. If one does not attend to something that might

create an emotional response, then it can be assumed that the emotional response will not be

forthcoming. The last two, cognitive change and response modulation, require that a person

engaged in an emotion generative process has already attended to the situation or stimulus and

must regulate their emotions at either the appraisal or response stage. Recall that defensiveness

implies that the threatening information has been attended to, and that defensive responding is a

reaction to the negative emotional experience of fear or anxiety stimulated by the message.

Therefore, the two emotion regulation strategies of interest to defensiveness literature are

suppression and reappraisal (parallel to the last two stages of the Blumberg's 2000 avoidance

model).

Emotion suppression involves the act of suppressing emotional responses to situations

and stimuli. Due to considerable evidence that emotion suppression has a high cognitive cost and

typically results in the suppressor feeling more negative affect afterwards (Gross, 2002), it has not received the same clinical attention as reappraisal has (Scherer, Schorr, & Johnstone, 2001). Reappraisal, due to its utility and lack of cost has garnered considerable attention over the past two decades. Reappraisal, or cognitive change, refers to changing an appraisal one makes in a way that alters the situation's emotional significance, either by changing how one thinks about the situation itself or how one thinks about one's capacity to manage its demands (Gross, 2008). This process is known to occur both effortfully and automatically (Mauss, Bunge, & Gross, 2007). Reappraisal also leads to decreases in negative emotion experience and expressive behavior (Dandoy & Goldstein, 1990; Gross, 1998). Critically, when faced with an unpleasant or "disgusting" stimulus, those scoring as high "reappraisers" on Gross and John's (2003) emotion regulation questionnaire (ERQ) show higher positive affect and lower negative affect. Therefore, people who are more likely to engage in reappraisal should experience more positive affect and less anxiety and fear when presented with the same negatively emotive stimulus such as a threatening health-risk fear appeal. Clearly this is more evidence that affect during defensiveness should be directly examined.

Recall the three primary components of Witte's (1994) extended parallel process model: vulnerability, severity, and efficacy. Reappraisal involves changing how one thinks about the situation itself. A defensive person engaged in reappraisal will likely modify their vulnerability (e.g., a personal risk estimate) and severity (e.g., prevalence or consequence) in order to regulate their emotional response to the unwelcome realization that they are in danger, and must regulate the emotional impact of that danger. Reappraisal's definition leaves efficacy malleable which is reflected in the slightly conflicting views of the stage model (de Hoog et al., 2007; where low efficacy is assumed) and the extended parallel process model (Witte, 1992; where low efficacy is

a predictor). Hedonically, reappraisal is beneficial as negative affect is down-regulated and the person generally feels better. However, this process is *re*appraisal, that is appraisal in novel terms that are more acceptable and *less threatening* to a person (defensiveness). The initial appraisal that a vulnerable person is so scared of is the *necessary* appraisal, not the less threatening *re*appraisal, which is presumably false, or at least less accurate, and thus, potentially costly to the person making it.

By examining the definition of reappraisal and the two most recent models of defensiveness, it seems apparent that defensiveness *is* cognitive reappraisal. It might be more parsimonious for defensiveness theory to state that fear control results in reappraisal, while danger control does not. The primary goal of this proposed study is to rectify the lack of attention to affect and emotional-regulation processes involved in defensiveness. Specifically, the role of cognitive reappraisal as an individual-difference strategy to down-regulate the negative emotion created by scientific fear appeals will be examined.

Chapter III: Study Overview

In order to characterize the nature of cognitive reappraisal during fear appeals, the proposed study will examine the impact of individual differences in emotion regulatory styles (Gross & John, 2003) on emotional and cognitive processes underlying defensiveness resulting from exposure to a health-risk fear appeal.

In this study, participants will report the amount of caffeine they consume on a regular basis (among other background questions), and will then be exposed to a mild fear appeal regarding caffeine intake and a possible link to cancer. Various measures will be taken during this exposure to examine how people are regulating their emotions based on whether or not they are measured to be suppressors or reappraisers using Gross' emotion regulation questionnaire (ERQ; Gross & John, 2003) and whether these different styles predict defensiveness and changes in state affect both after exposure to an emotive fear-appeal and potential outcomes of danger (protective) or fear control (defensive) responses. To the extent defensiveness involves re-appraisal that serves to reduce fear, the reappraisal subscale on the ERQ should predict lower decreases in positive affect and greater increases in negative affect (particularly anxiety) across state affect measurements.

Participants' state affect will be measured using a new implicit measure of affect, the implicit positive and negative affect task (IPANAT; Quirin et al., 2010). The IPANAT (read "eep' ah not") is theorized to measure the automatic activation of cognitive representations of affective experience (Quirin et al., 2009). During administration of the IPANAT, a participant is presented with non-words and is told to rate how they feel the word conveys mood on multiple affective dimensions. It is presumed that, in the absence of any other cues, participants would tap their own emotional state to rate these non-words (i.e., use their mood as information, Schwarz

& Clore, 1983). There are important reasons for using the IPANAT rather than a traditional self-report measure of affect. Using an implicit, indirect affect measure should reduce focus on the expression of emotions in general, as there is evidence that merely expressing emotions is a form of emotion regulation (Kassim & Mendes, 2011). Also, the implicit measure provides a more realistic measure of actual affective experience without participants knowing that we are keenly interested in how they feel after they are told they are at an increased health risk. It is presumed that this prior knowledge might lead to socially desirable responding.

Additionally, since personal efficacy is a key predictor of defensiveness in the extended parallel process model, and since reappraisal can involve modifying perceptions of personal efficacy, participants' perceptions of efficacy regarding changes in their behavior will be measured. In addition, both a global self-efficacy scale (GSES; Schwarzer & Jerusalem, 1995) as well as the multi-dimensional health locus of control scale (MHLC; Wallston, Wallston, & DeVellis, 1978) will be administered.

Hypotheses

Participants' caffeine intake levels will be assessed and used as a risk factor to predict defensiveness. Additionally, all participants will be female and thus, vulnerable to the caffeine and ovarian cancer risk described in the article. People would typically increase their personal risk estimate of getting cancer in the face of scientific evidence such as this if they were using danger control to process the information. I presume, however, that participants will engage in fear control (defensiveness), and thus participants' level of reported caffeine intake will be *negatively* correlated with their self-assessed probability of developing cancer and their estimation of the prevalence of cancer (as in Lieberman & Chaiken, 1992). So, the more caffeine

a person uses, the lower their reported perception of their own chances of developing cancer and their estimation of how many people get cancer. Thus, it is hypothesized that:

1. Participants' reported level of caffeine intake will correlate negatively with message acceptance.

2. Participants' caffeine intake will correlate negatively with changes in their cancer risk estimates.

These first two hypotheses examine whether defensiveness occurs in this study overall. The remaining hypotheses examine whether higher reappraisal intensifies defensiveness. Key to the final hypotheses is connecting individual differences in reappraisal to defensiveness, i.e., message acceptance and risk estimate changes. These hypotheses also consider the possible mediation of vulnerability (caffeine intake) and reappraisal's influence on defensiveness by negative affect. Gross and John (2003) found that reappraisal predicted a decrease in negative affect using the positive and negative affect schedule (PANAS; Watson, Clark, & Tellegen, 1988). Therefore, the notion that reappraisal accounts for defensiveness in this context suggests that:

3. Reappraisal among those who are vulnerable will predict increased defensiveness as measured by increased counter-argumentation and reduced perceptions of vulnerability (the primary dependent variables).

4. In addition, reappraisal should predict a greater *decrease* in negative affect across measurements of state-affect for those high on vulnerability.

5. Finally, changes in negative affect should account for lower defensiveness among those at risk who are high on reappraisal.

If people high on reappraisal experience lower negative affect the second time affect is measured (after the participants presumably employ their emotion regulation strategy of choice in their effort to down-regulate the negative affect caused by the health message), then this suggests that reappraisal is likely a strong candidate in explaining what is occurring during defensiveness.

Methods

Purpose. To demonstrate that reappraisal is occurring during fear control responses to fear appeals, and to test the hypothesis that individual differences in cognitive reappraisal promote defensiveness, i.e., people who are more likely to employ cognitive reappraisal to regulate their emotional response to unpleasant situations and stimuli are more defensive as measured using the previously discussed indicators of defensiveness (Good & Abraham, 2008).

Participants

Recruiting. All participants were female undergraduate students at Iowa State University participating to satisfy a partial course requirement for various introductory psychology and communications courses. They registered online on SONA to participate in an online survey hosted by Surveymonkey.com. All eligible students with access to SONA were allowed to participate, regardless of their status as daily caffeine users.

Power. Plans were made to recruit at least 150 participants to complete the survey due to the use of multiple regression analyses of the survey data in order to ensure .80 power for detecting a minimal correlation of .25. Data from 186 participants was collected over a four week period.

Procedure

For a complete outline of the procedure, refer to Appendix A. After indicating their desire to participate, individuals read the cover story and were told: "Thank you for participating in this

online study. The aim of the study is to examine how people comprehend health-relevant information that is presented online. Specifically, we are interested in how multi-tasking affects people's processing of self-relevant information (in this case regarding their health), and whether personality factors affect these processes. For example, you may be buying an item on Amazon.com while reading about tuition increases in the online-edition of the ISU Daily, or you may be chatting on Facebook while you check your grades."

"In this study, you will first learn about important information regarding medical research on cancer and will then provide your opinions about it. While doing this, on two occasions you will also respond to a parallel letter-rating task. It is important that you pay full attention to both sets of questions in order to best simulate a multi-tasking web-surfing experience. Finally, you will respond to a series of personality questionnaires. The whole study should take around about 35 minutes."

Please follow the instructions at the top of each page. You may also view your progress by looking at the progress bar. Click 'next' to begin".

Participants were then asked background health questions (Appendix A.2). Buried in these questions was an item in which participants estimated how many servings of caffeine they consume on a weekly basis. This measure of caffeine intake served as the primary dependent measure of participant vulnerability which was assumed to be a predictor of defensiveness, according the previous findings examined in the introduction. Participants were also questioned regarding their ability to reduce caffeine intake as well as their dependency on caffeine in order to gauge their personal efficacy specifically regarding caffeine consumption.

Next, participants were presented with the first half of the threatening health-risk article linking caffeine to cancer via hormone fluctuations due to caffeine intake (Appendix A.3). Along

with this half of the article, a photo from a surgery depicting part of an ovarian torsion correction procedure was shown. After participants were done viewing the photo, they completed the first iteration of the IPANAT (Appendix A.4) using six non-word-strings that have been pretested on Iowa State undergrads (n = 22) for meaninglessness and neutrality of emotional meaning.

After the IPANAT, participants viewed the second half of the article (Appendix A. 5) which included a variety of scientific information. Then, participants answered questions to provide the primary defensiveness DVs used in the analyses (Appendix A.6). The DVs included personal assessments of risk, message acceptance, prevalence, seriousness, and reactance. Next, participants completed another iteration of the IPANAT using six different pre-tested terms, randomized among participants. After this, participants completed a brief multiple choice "quiz" assessing participant recall of facts from the article in order to assess their memory performance (Appendix A.8). The study concluded with measurements of willingness and behavioral intention (A.9), and five brief individual difference measures (A.10) including the emotion regulation questionnaire (ERQ; Gross & John, 2003) to measure emotion regulation style, a ten-item neuroticism scale (IPIP-N; Goldberg et al., 2006), Miller's monitoring and blunting scale (MBSS; Miller, 1987) to control for potential avoidant responses (See figure 1), Heppner, Cook, Wright, and Johnson's (1995) problem-focused coping scale (PF-SOC), and the previously mentioned general self-efficacy and multi-dimensional health locus of control scales. After these measures were taken, participants were debriefed.

Chapter IV: Results

In order to analyze the study hypotheses, various difference scores and indices were created from the data.

Variable Definitions

NA change. A difference score variable representing change in negative affect from the participant's first exposure to the IPANAT (midway through the message) ($\alpha = .867$) to their second exposure to the IPANAT (after the defensiveness measures were completed) ($\alpha = .910$) was calculated ($\alpha = .711$). The NA difference variable was calculated by summing the values for the negative affect terms in both iterations of the IPANAT, and subtracting the aggregated value for time 1 from time 2. Thus, a negative NA difference value indicates a decrease in negative affect.

Risk estimate change. Difference scores in risk estimates, measured during the study as "percent chance of development during (my) lifetime" were also calculated. Participants' rating of the percent-chance of developing any type of cancer measured during the collection of participant background information in the first part of the study (time one) was subtracted from ratings of the percent-chance of developing any type of cancer measured after reading hormone-cancer article (time two). This variable will be referred to as *risk estimate change for any cancer*. A similar procedure was performed to calculate the participant's change in risk estimates for developing more severe, invasive cancer, which will be referred to as *risk estimate change for invasive cancer*. Positive values for changes in risk estimate indicate an *increase* in participant risk estimates from time one (before the article) to time two (after the article).

Message acceptance. Also, a message acceptance index was created by summing participant's ratings of the quality of the information, quality of the credentials, and belief in the

hormone-cancer link they read about. This 3-item index was sufficiently reliable ($\alpha = .606$) given the loosely-based relationship of the measured variables and will be treated as an overall index of message acceptance.

Vulnerability (caffeine intake). The amount of servings of caffeine participants reported using each week was used as the primary indicator of vulnerability to developing cancer based on the caffeine-hormone link reported in the article. Participants reporting using more caffeine on a weekly basis are theoretically more vulnerable to developing cancer based on the article they read.

Caffeine dependence. An index of caffeine dependence ($\alpha = .891$) was created by summing participants' self-reported "liking" of caffeine, expected difficulty in reducing the caffeine consumption, and daily functional dependence on caffeine (see Appendix A.2). This was done to in order to contrast the role of intake with the role of dependence as indicator of vulnerability that motivates defensive processing.

Reactance. Three measurements of reactance to the article were aggregated to form a reliable ($\alpha = .868$) reactance index. The individual reactance measures were participant's ratings of the article's attempts at manipulation, making health-behavior decisions for the reader, and pressuring the reader. This index was used in exploratory analyses.

Reappraisal. Reappraisal as an individual difference characteristic was calculated from participant's ERQ ratings. Participants who are more likely to use cognitive reappraisal as an emotion regulation strategy have higher ERQ-reappraisal scores.

Analyses

Overall defensiveness to the message. In general, defensiveness to the presented health-risk information was not found. After reading the article, participants on average significantly

increased personal risk estimates of developing cancer from a mean of 39.82% (*SD* = 25.16) to 41.07% (*SD* = 24.00), *t*(180) = 2.13, *p* = .034. Similarly, participants significantly increased personal risk estimates of developing invasive cancer from 32.08% (*SD* = 24.29) to 33.19% (*SD* = 24.19), *t*(177) = 2.14, *p* = .034. Although these increases were minute, this pattern is indicative of a lack of defensiveness to the article. Accordingly, vulnerability (measured either by caffeine intake or dependence) was not related to individual indicators of message acceptance as indicated by the data in Table 1, or to the overall index of message acceptance (Table 2).

Table 1

Correlations between vulnerability and message acceptance

Measure	2	3	4	5	6	7	8
1.Caffeine Intake	.469**	.069	-.002	-.018	.099	.061	.037
2.Reported Caffeine Dependence		-.002	-.053	.031	.000	-.004	-.179*
3.Rated quality of information				.393**	.319**	.075	.144	.180*
4.Rated researchers credentials					.336**	.089	.106	.206**
5.Belief in Caff/Cancer Link						.110	.075	.338**
6.Chance to develop any cancer							.867**	-.015
7.Chance to develop invasive cancer								-.034
8.Belief people should decrease use								

Note. * = p < .05, ** = p < .01; n = 186

Table 2

Correlations between vulnerability, dependence, and reduction belief

Measure	2	3	4	5	6
1.Caffeine Intake	.469**	.037	.010	.017	-.076
2.Caffeine dependence			-.179*	.298**	-.039 -.019
3.Belief people should reduce their caffeine intake				.024	.331** .064
4.Reactance to the article					-.131 .078
5.Overall message acceptance					.017
6.ERQ reappraisal score					

Note. * = p < .05, ** = p < .01; n = 186

The Role of Reappraisal in Defensiveness. Recall the hypothesis that reappraisal would predict increased defensiveness as measured by decreased message acceptance among heavy caffeine users. Specifically, each measure of message acceptance (i.e., participants' information quality rating, researcher credentials rating, and belief in the caffeine/cancer link), as well as the overall index of acceptance, was regressed on vulnerability, ERQ reappraisal score, and their interaction (after centering). Similar regressions were performed on measures of personal risk or negative affect, although none were significant. However, marginally significant interactions between reappraisal and vulnerability were found for information quality, researcher credentials, and overall message acceptance, but not for belief in the caffeine/cancer link (Table 3).

Table 3

Interactive effects of vulnerability and reappraisal (standardized slopes) on indicators of message acceptance (information quality, credentials quality, belief in caffeine/cancer link), state negative affect and negative affect changes, and personal risk estimates.

Dependent variable	β	t	Sig. (p)	ΔR^2
Information quality	-.143*	-1.807	.072	.018
Credentials quality	-.153*	-1.925	.056	.004
Belief in caff/cancer link	-.054	-.667	.506	.003
Message acceptance index	-.148*	-1.864	.064	.020
Develop any cancer risk change	-.009	-.111	.912	.000
Develop invasive cancer risk change	.016	.202	.840	.000
Negative Affect during article	-.006	-.074	.941	.000
Negative Affect after def. measures	.030	.030	.716	.001
Negative Affect change	.065	.731	.466	.004

Note. *p<.1, **p<.05; Message acceptance index is comprised of information quality, credentials quality, and belief in the caff/cancer link variables. ΔR^2 indicates the proportion of additional variance accounted for by the interaction term.

Simple slope tests were performed on these interactions based on the following values. High and low points for reappraisal were created by adding and subtracting 1 standard deviation from the centered mean (SD = .99). High and low points for vulnerability (SD = 8.18) were created by adding 1 standard deviation to the centered mean of caffeine intake (SD = 8.18) and subtracting one-half of the standard deviation, 4.09, from the centered mean of caffeine intake as the mean of caffeine intake (M = 5.73) is lower than the value of the standard deviation due to the positive skew of the data. All analyses were done using a researcher-created Excel program

(IRSE; Meier, 2008) to graph the interaction and compute the simple slope significance test (Aiken & West, 1991).

Information quality. The interaction between reappraisal and vulnerability was a marginally significant predictor of participant ratings of information quality. The slope of reappraisal at high vulnerability was -.04, $t(174) = -.76$, $p = .45$ indicating a non-significant decrease in rated quality of information as reappraisal increased for participants high in vulnerability. The slope of reappraisal at low vulnerability was .16, $t(174) = 3.03$, $p = .003$ indicating a significant increase in rated quality of information as reappraisal increased for participants low in vulnerability (Figure 3).
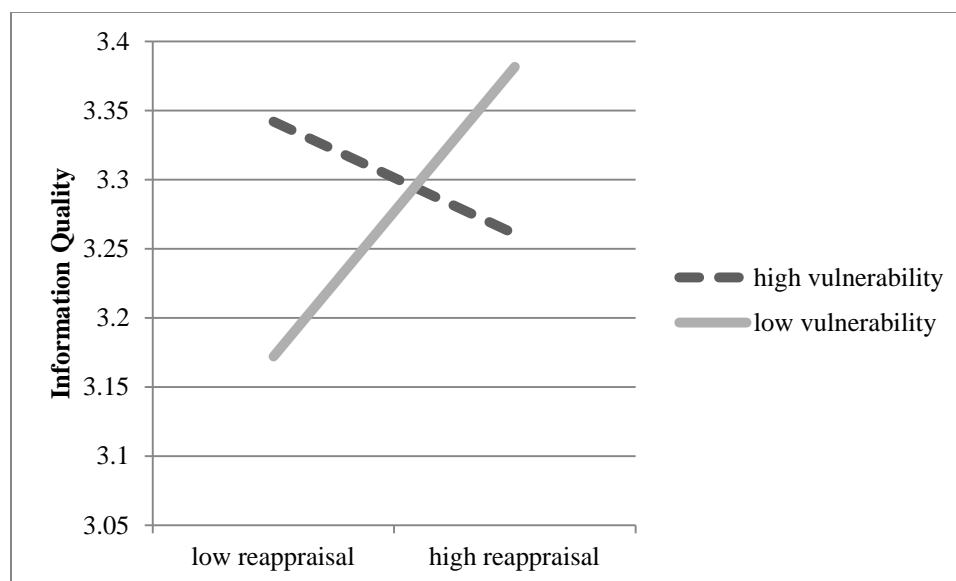
Figure 3. Interaction of vulnerability and reappraisal on participant rated information quality.

Researcher credential quality. The interaction between reappraisal and vulnerability was a marginally significant predictor of participant ratings of researcher credentials. The slope of reappraisal at high vulnerability was -.12, $t(174) = -1.97$, $p = .050$ indicating a significant

decrease in rated credentials quality as reappraisal increased for participants high in vulnerability. The slope of reappraisal at low vulnerability was .11, $t(174) = .1.91$, $p = .057$ indicating a marginally significant increase in rated credentials quality as reappraisal increased for participants low in vulnerability (Figure 4).
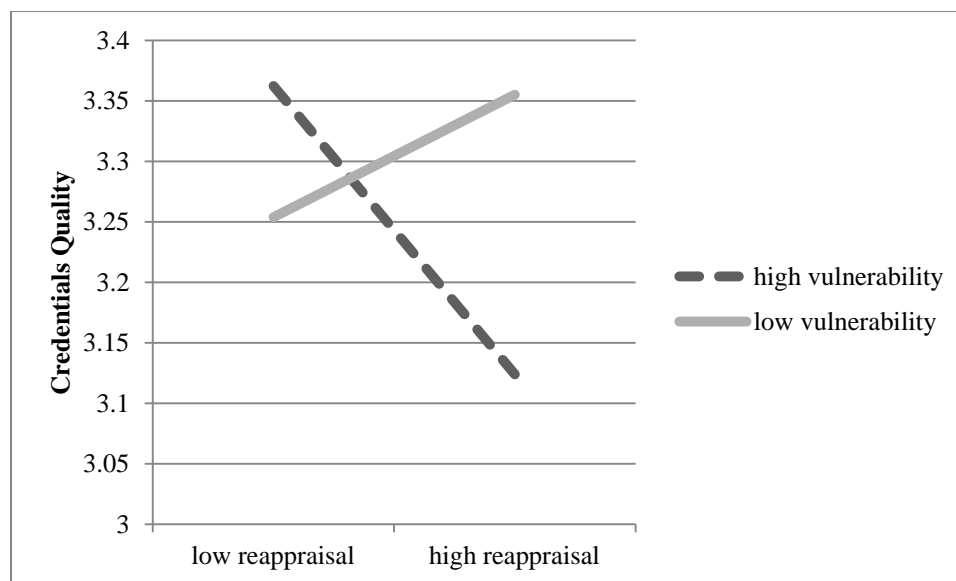
Figure 4. Interaction of vulnerability and reappraisal on participant rated researcher credentials quality.

Belief in the caffeine/cancer link. The interaction between reappraisal and vulnerability was not a significant predictor of participant ratings of participant belief in the caffeine/cancer link presented in the article, so no simple slope tests were performed.

Overall message acceptance. The interaction between reappraisal and vulnerability was a marginally significant predictor of overall message acceptance. The slope of reappraisal at high vulnerability was -.22, $t(174) = -5.86$, $p < .001$ indicating a significant decrease in message acceptance as reappraisal increased for participants high in vulnerability. The slope of

reappraisal at low vulnerability was .20, $t(174) = .5.01$, $p < .001$ indicating a significant increase in message acceptance as reappraisal increased for participants low in vulnerability (Figure 5).
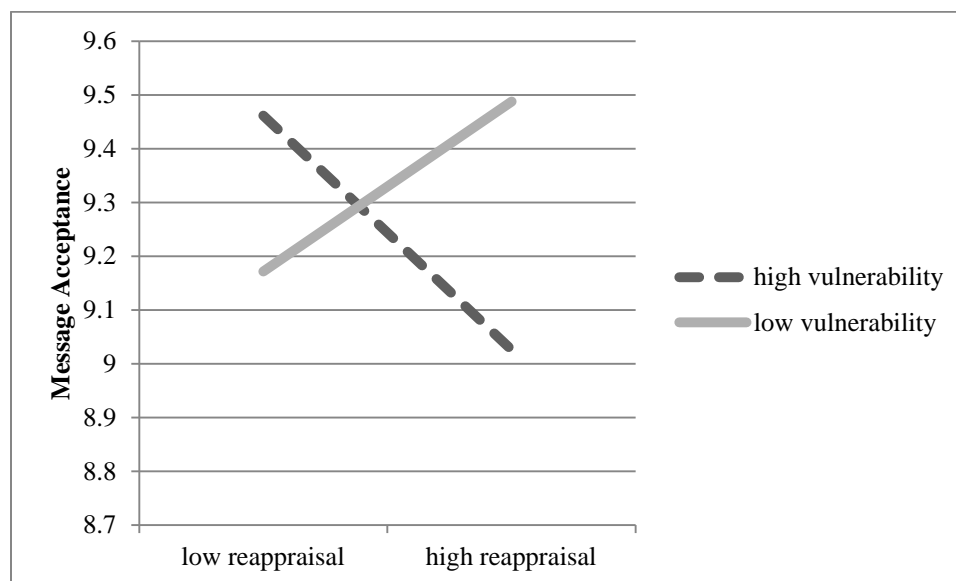
Figure 5. Interaction of vulnerability and reappraisal on participants'
message acceptance.

Although marginal, the significant interactions of vulnerability and reappraisal on information quality, credential quality, and overall message acceptance provide evidence that vulnerable people (i.e., frequent caffeine drinkers) who are likely to use reappraisal as an emotion regulation strategy are less likely to accept the message. In other words, among high caffeine users it is those who were higher on reappraisal that were the most skeptical of information in the message. No other significant interactions were found using the variables explicitly defined in the hypotheses (see Table 3).

It also worth examining the links between vulnerability and reactance to the article. The reactance index correlated significantly with the caffeine dependence index, though not with caffeine intake (Table 2). Since intake correlated with dependence, reactance's unique

correlation with dependence suggests that people's personal perceptions of their own caffeine dependence predicts reactance to threatening information while mere frequency of use does not. Therefore vulnerability and dependence, though related, are two distinct concepts. Participants who reported more caffeine dependence were also less likely to agree that people should decrease their caffeine intake. These findings will be considered again in the discussion.

Negative affect in defensiveness. In general, negative affect decreased from the first IPANAT rating ($M = 2.08$, $SD = .41$) to the second IPANAT rating ($M = 1.98$, $SD = .46$), $t(148) = -3.415$, $p = .001$. Positive affect decreased marginally significantly from the first IPANAT rating ($M = 5.92$, $SD = 1.23$) to the second IPANAT rating ($M = 5.81$, $SD = 1.36$), $t(156) = -1.75$, $p = .082$. Increased perception of cancer risk predicted lower reduction in negative affect (Table 4).

Table 4

Correlations between vulnerability, message acceptance, reappraisal, risk differences, and affect differences

Measure	2	3	4	5	6	7	8
1.Vulnerability	.469**	.017	-.076	.173*	-.023	.067	-.153
2.Caffeine Dependence		-.039	-.019	.099	.084	.045	-.018
3.Overall Message Acceptance			.017	.021	.061	-.055	.195*
4.Reappraisal				.068	.069	-.037	-.010
5.Chance of developing any cancer difference					.519**	-.159	.022
6.Chance of developing invasive cancer difference						-.170*	.133
7.Negative affect difference							-.232*
8.Negative affect during article							

Note. *p<.05, **p<.01

From the table, increased vulnerability did predict slightly higher increases in risk perceptions, but vulnerability was not a significant predictor of change in negative affect. Also, reappraisal did not predict negative affect change, so there was no basis to test for mediation of change in negative affect by reappraisal. Accordingly, there was no interaction between reappraisal and vulnerability when regressed on negative affect during the message (time 1), negative affect after the message (after the defensiveness measures were taken, time 2), or negative affect change (Table 3). Also, there were no significant interactions between reappraisal and dependence when regressed on the same negative affect measurements. Therefore it is

unlikely that a clear relationship between affect and defensiveness can be detected from the data,

so no more analyses involving affect were performed.

Chapter VI: Discussion

To summarize the results, evidence for defensiveness among caffeine users in general was not found. Reappraisal did, however, interact with vulnerability to predict more defensive responses to a threatening health-risk message in regards to overall message acceptance. This finding alone is important to both the defensiveness and emotion regulation literature, given the theoretical gaps in our understanding of defensiveness and the presumed role of re-appraisal in reducing negative affect. However, evidence for a key role of negative affect in defensiveness or its consequences on risk perceptions was not found. There are several potential issues that might have played a role in this study's failure to find evidence for some of the hypotheses.

The Lack of (General) Defensiveness

Risk perceptions increased overall among participants, and vulnerability did not predict less acceptance of the message, decreased risk estimates, or changes in risk estimates. The stimulus used in the study might be partly to blame. Besides the picture of an ovarian torsion correction procedure, the article rather gently posited a link between caffeine and cancer. The message's benign prose, declarative style, and balanced presentation of various outcomes that might result from the use of caffeine made for a "threatening" message that might have been interpreted as somewhat common-place or even sterile by participants. As stated in the literature review, people are constantly bombarded by messages that are much less impartial than the one employed in this study. The link between caffeine and cancer is also somewhat convoluted in the message, given that hormone imbalances as a result of excessive caffeine intake were a key intermediary in the link. Understanding the impact of caffeine consumption might have required a level of technical knowledge, or at least concerted investment in the examination of the message. Recall from the extended parallel process model that the consequences of failing to

take the prescribed action must be *perceived* as sufficiently severe (Witte, 1992; 1994). Thus, in the future it might be useful to use a message similar to the one used in this study as well as a message with more definite assertions which might be a larger cause for concern. It might also be useful to measure how invested participants are in examining the message by timing how long they read the message and analyzing those data along with affect changes. Extreme negative affect or emotional reactivity to the message might interact to predict the length of time spent examining the message. Besides the potential failure to induce a high enough level of fear, there are other potential reasons for the lack of overall defensiveness, described next.

Sampling Issues

Vulnerability to the threat presented in the message (i.e., caffeine intake) was extremely positively skewed. Participant mean weekly caffeine intake was 5.73 servings of caffeine per week – a little under one serving per day. The median was 3 servings per week, and the standard deviation was 8.18 with a range of 0 servings to 72 servings (see Figure 7 for a histogram of caffeine intake).

Attempts at both data transformation using square-root, inverse, and logarithmic transformations as well as removing extreme (over three standard deviations from the mean) outliers resulted in the elimination of evidence for defensiveness based on vulnerability's interaction with reappraisal. In the design phase of the study it was presumed that caffeine use was more prevalent among college students, but according to the data, it appears as though college students at Iowa State University do not generally use caffeine to excess. Examining Figure 6 one can see that only a relative handful of students report using more than two servings of caffeine per day. This is potentially problematic for a study of this nature as highly vulnerable people are greatly under-represented in the sample. Given these sampling considerations and the

apparent extreme leverage the few highly-vulnerable participants held, future studies involving this or a similar paradigm should likely employ recruiting procedures that target heavy caffeine users who are presumably more vulnerable to the described threat. Again, recall from the extended parallel process model (Witte, 1992; 1994) that participants must perceive themselves to be vulnerable to the described threat for defensiveness to occur. In this study, such vulnerability may have only typified those with extremely high levels of caffeine consumption.

Histogram
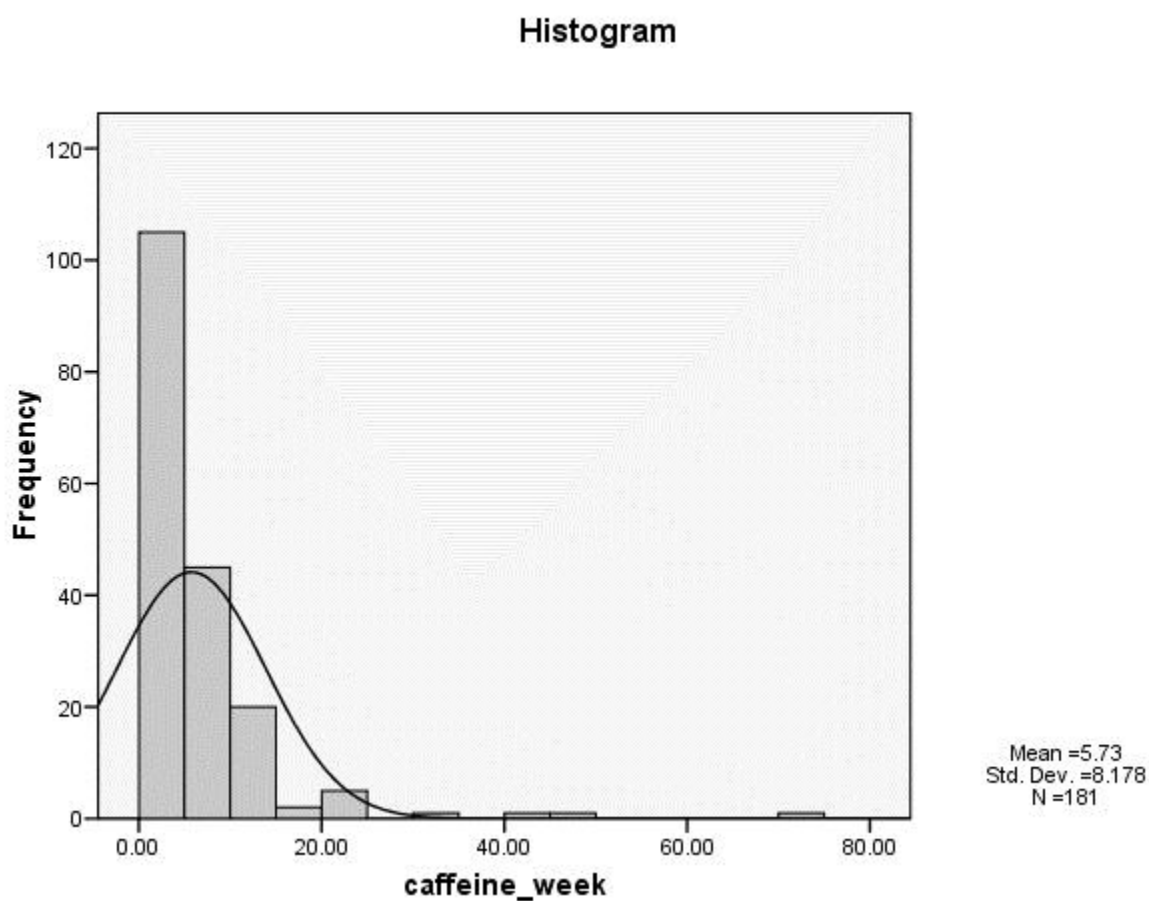
Figure 6. The positively skewed data set used for analyses.

When Defensiveness (Does Not) Occur

Participants who were both low on vulnerability to the cancer threat described in the message and high on reappraisal did not display defensiveness to the message. In fact they were more likely to accept the message (note the "cross-over" nature of the interactions in Figures 3 to 6) than those who were lower on reappraisal. Understanding why this is the case might be interesting in future studies examining reappraisal in defensiveness. One possible reason for this trend might be a potential relationship between reappraisal and need for cognition (Cacioppo & Petty, 1982); reappraisal is related to the broad trait of openness to experience, which subsumes the need for cognition (Gross & John, 2002). Thus, having the tendency to search for alternate perspectives on emotional events (reappraisal) might be related with the tendency to pay close attention to relevant arguments (need for cognition). People who are less vulnerable and thus less likely to react defensively based on the predictions of the extended parallel process model would presumably be more likely to attend to relevant arguments when high on reappraisal, and eventually endorse them.

Marginally significant interactions of reappraisal and vulnerability on message acceptance (i.e., information quality ratings as well as researcher credential ratings) were observed in the study and were consistent with the hypotheses. Increased reappraisal among heavy caffeine users predicted decreased message acceptance. It is possible then, that among some participants the message *was* threatening enough that those participants had the need to regulate their emotional responses to the message, although there is no direct evidence demonstrating the relationship with affect measurements. Though marginal, the consistent predictions of each of the marginally significant regression models in regards to message acceptance offer encouraging evidence for the role of down-regulation of negative affect during

defensiveness. Reappraisal, an emotion regulation strategy, does seem involved in defensive responding, and it is suspected that this relationship would occur via down-regulating unwanted negative emotions.

How long, however, does the emotion regulation process take to complete? It is possible, even likely, that people are able to regulate their emotions very rapidly when necessary. From the time participants where first presented with threatening information about their health behaviors until the time the last measurement of affect was taken (after the defensiveness measures), there is really no telling exactly when participants regulated their emotions, or how long it took them to do so. There was no predictive relationship between negative affect and either caffeine intake or dependence, nor did either interact with reappraisal to predict negative affect during the message (time 1), after the message (after the defensiveness measures were taken, time 2), or across measurements. It is not outside the realm of possibility that participants may have undergone regulation of emotion prior to the initial affect measurement. A replication which assesses affect prior to and immediately following the message may be more effective in capturing consequences of quick regulation processes.

The current study is the first to examine defensiveness in the context of Gross' emotion regulation. Aside from evidence from both Mauss and colleagues (2007) and Gross (2003) that emotion regulation occurs intentionally and automatically, and with a certain level of likelihood across individuals; precious little is known about the phenomenological function of emotion regulation. It is possible that the question of *how* people regulate their emotions must necessarily include the pace and timing at which they do so. Delving much deeper into the "how" issue of the phenomenological experience, or process, of emotion regulation is an important line of research given the clear effects that have been found with it along with the considerations raised

in this research. Employing bio-psychological measurement, ERP, or even merely a strict phenomenological approach might shed necessary light on these emotion regulation processes in order to demonstrate the proper timing for the measurement of affect in defensiveness. At the very least, in future studies reminding participants that they are caffeine drinkers themselves directly before they are asked to respond to defensiveness questions or rate their affect might be useful.

Implicit Affect

Finally, the IPANAT, a very novel measure of implicit affect, was employed in an attempt to guard against demand characteristics and the potential for automatic emotion regulation during affect reports themselves (see introduction). The possibility that participants were not fully aware that their own affective state was being assessed may have led to muted effects on affective change. Implicit affect might be a misnomer such that in order for people to actually understand and report how they feel, they must know that they are thinking about how they are feeling and not trying to rate how non-sense words make them feel. The projective hypothesis is at least as logically sound for the measurement of affect as it is for the frequently maligned use of the Rorschach or Thematic Apperception Test, but the true nature of what affect is and how it is captured in research might not lend itself to this logic. It remains to be examined whether explicit measures of affect (e.g., PANAS, Watson & Clark, 1985) would be better able to capture these affective changes.

Conclusion

Putting design and sampling limitations aside, the interaction of reappraisal with vulnerability in predicting message acceptance, as well as relation between caffeine dependence and reactance suggest that pursuing these issues is a promising route for research on

defensiveness. In this study where participants were faced with information that should have caused an emotive response, the tendency for vulnerable individuals high on reappraisal to reject the message at least implies that down-regulation of negative affect is involved. Furthermore, exploratory analyses demonstrated that reactance might have an interesting relationship with defensiveness as participants who reported more dependence on caffeine reported that they felt more manipulated, pressured, or controlled than those who were less dependent on caffeine (Table 2). Vulnerability (intake) did not predict this relationship. It is possible that reactance is an important part of defensiveness processes that deserves a closer examination. Taken as a whole, the results of this study demonstrate that emotion regulation, reappraisal in particular, likely plays a role in defensive processing. These findings should be understood as foundational work which will further aid our understanding of important processing underlying defensiveness to threatening health-relevant messages.

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Appendix A.1

Understanding Health-Risks Study Procedure

Instructions, cover story:

"Thank you for participating in this online study. The aim of the study is to examine how people comprehend health-relevant information that is presented online. Specifically, we are interested in how multi-tasking affects people's processing of self-relevant information (in this case regarding their health), and whether personality factors affect these processes. For example, you may be buying an item on Amazon.com while reading about tuition increases in the online-edition of the ISU Daily, or you may be chatting on Facebook while you check your grades.

In this study, you will first learn about important information regarding medical research on cancer and will then provide your opinions about it. While doing this, on two occasions you will also respond to a parallel letter-rating task. It is important that you pay full attention to both sets of questions in order to best simulate a multi-tasking web-surfing experience. Finally, you will respond to a series of personality questionnaires. The whole study should take around about 35 minutes.

Please follow the instructions at the top of each page. You may also view your progress by looking at the progress bar. Click next to begin"

Appendix A.2

Background Health Questions
Because you will be reading about be medical information relevant to behavior, we would like to gather very basic background information so that we can control for these prior experiences. Please answer the following questions as accurately and honestly as you can:

1. How many times a week do you eat sweets (e.g., desert, candy bars, chocolate): _____ x times / week
2. How difficult would it be for you to reduce your intake of sweets?
3. How many servings of caffeine do you typically drink each week? ("one serving of caffeine" = one 12 oz can of caffeinated soda, one 8-12 oz cup of coffee, half a can of any energy drink (e.g.: Rockstar, Red Bull, etc.), or any small 8-12 oz coffee-shop specialty drink) _____ servings/week
4. Using the following scale, please rate how much you like caffeinated beverages compared the average ISU student. _____ 1 = don't like at all, 2 = like somewhat less than the average ISU student, 3 = like as much as the average ISU student, 4 = like more than the average ISU student, 5 = like considerably more than the average ISU student
5. How difficult would it be for you to reduce your caffeine intake: _____ 1 = not at all difficult, 2 = slightly difficult, 3 = moderately difficult, 4 = very difficult, 5 = extremely difficult
6. How often do you count on caffeine to get you through the day?[1 = not at all, 2 = rarely, 3 = occasionally, 4 = often, 5 = most of the time] _____ "
7. How much do you count on sweets to get you through the day1 = not at all, 2 = rarely, 3 = occasionally, 4 = often, 5 = most of the time]\
8. Do you have anyone if your immediate family that has been diagnosed with cancer? Yes: ___ No:___
9. Have you ever been diagnosed with hypertension (i.e., high blood pressure)? Yes:__No:____
10. Have you attended a yearly physical examination over the last 2 years? Yes___No_____

Appendix A.3

INFO 1

"Next, you will be presented with real information that might be relevant to you. This information is from the Reuters News Service which often reports on important health information. On two occasions while reading this information, you will be directed to complete the letter-rating task. Please take information on each screen seriously. Whenever you are ready to continue, please click next.

Hormones <u>may</u> tie caffeine to cancer risk

(Reuters Health) - Coffee and general caffeine intake may affect a woman's levels of estrogen and other sex hormones, a new study suggests -- offering a potential explanation for findings that link caffeine to certain cancers.

Several studies have found connections between caffeine and breast and ovarian cancers. For instance, different analyses of the Nurses' Health Study (NHS) -- a large, long-running study of U.S. female nurses -- have linked higher caffeine intake to a higher risk of ovarian cancer before menopause.

Since estrogen and other sex hormones play a role in both diseases, it's possible that caffeine affects the risks of the cancers via hormonal influences, note investigators Dr. Joanne Kotsopoulos and colleagues at Harvard Medical School. Cancer diagnoses are serious and in many cases require major surgery with considerable risks. (cotd.)

SOURCE: Cancer, June 15, 2009.

Appendix A.4

IPANAT 1
"Before continuing, please turn your attention to the letter-rating task . Read the instructions below and respond intuitively."

The following words are from an artificial language. They are intended to express various moods. In all languages, there are words that already express their meanings by the way they sound (for example, the word "rattle" sounds almost like something that rattles). For each of the following words, please rate how well each artificial word expresses different moods (for example, How much does the sound of the artificial word "FILNU" conveys each of the following moods: pleased, distressed, energetic, tense, cheerful, anxious)? Let your ratings be guided by your feelings.

	Doesn't fit at all	Fits somewhat	Fits quite well	Fits very well
	☐	☐	☐	☐
SAFME pleased				
distressed	☐	☐	☐	☐
energetic	☐	☐	☐	☐
tense	☐	☐	☐	☐
cheerful	☐	☐	☐	☐
anxious	☐	☐	☐	☐
	☐	☐	☐	☐
VIKES pleased				
distressed	☐	☐	☐	☐
energetic	☐	☐	☐	☐
tense	☐	☐	☐	☐
cheerful	☐	☐	☐	☐
anxious	☐	☐	☐	☐
	☐	☐	☐	☐
TUNBA pleased				
distressed	☐	☐	☐	☐
energetic	☐	☐	☐	☐
tense	☐	☐	☐	☐
cheerful	☐	☐	☐	☐
anxious	☐	☐	☐	☐
	☐	☐	☐	☐
TALEP pleased				
distressed	☐	☐	☐	☐
energetic	☐	☐	☐	☐
tense	☐	☐	☐	☐
cheerful	☐	☐	☐	☐
anxious	☐	☐	☐	☐
	☐	☐	☐	☐
pleased				
distressed	☐	☐	☐	☐

	energetic	☐	☐	☐	☐
BELNI	tense	☐	☐	☐	☐
	cheerful	☐	☐	☐	☐
	anxious	☐	☐	☐	☐
		☐	☐	☐	☐
	pleased				
	distressed	☐	☐	☐	☐
	energetic	☐	☐	☐	☐
SUKOV	tense	☐	☐	☐	☐
	cheerful	☐	☐	☐	☐
	anxious	☐	☐	☐	☐

Appendix A.5

INFO 2
"Here is the remainder of the article, click next when you have finished."

The Harvard team looked at the relationship between coffee and caffeine intake and hormone levels among more than 1,200 women involved in the NHS.

At various points during that study, the women had completed questionnaires on their diets and other lifestyle factors, and provided blood samples. Kotsopoulos and her colleagues used those stored samples to measure the women's levels of estrogen and other sex-related hormones.

Overall, the researchers found, the more coffee and caffeine a premenopausal woman consumed, the lower her levels of estradiol, a form of estrogen, during the second half of the menstrual cycle.

Meanwhile, higher caffeine intake was related to higher levels of another sex hormone, progesterone, the researchers report in the Journal of Cancer.

The findings were somewhat different among postmenopausal women. For them, greater coffee and caffeine consumption was linked only to higher levels of sex hormone-binding globulin, or SHBG. Some studies have linked higher levels of SHGB -- which decreases the activity of estradiol and testosterone -- to a lower risk of breast cancer in postmenopausal women, Kotsopoulos and her colleagues note.

In theory, lower estrogen levels in premenopausal women would help protect against ovarian cancer -- so the findings do not explain the earlier results linking higher caffeine intake to a higher risk of premenopausal ovarian cancer.

Accordingly, the researchers write, the results suggest that caffeine influences sex hormone levels. They say, that more studies are needed to provide further evidence for how those influences affect hormone-related cancers.

SOURCE: Cancer, June 15, 2009.

Appendix A.6

PRIMARY DVs
At this point, we would like to solicit your reactions and opinions regarding the information you just read about.

RISK/SUSCEPTABILITY

How susceptible do you believe you are to developing cancer? _____ 1 = not at all susceptible, 2 = slightly susceptible, 3 = somewhat susceptible, 4 = quite susceptible, 5 = highly susceptible

How easy is it for you to imagine developing cancer as a result of increased hormone levels? _____ 1 = very difficult to imagine, 2 = somewhat difficult to imagine, 3 = neither very difficult nor easy to imagine, 4 = somewhat easy to imagine, 5 = very easy to imagine

How susceptible do you believe you are to developing increased hormone levels? _____ 1 = not at all susceptible, 2 = slightly susceptible, 3 = somewhat susceptible, 4 = quite susceptible, 5 = highly susceptible

How easy is it for you to imagine developing increased hormone levels? _____ 1 = very difficult to imagine, 2 = somewhat difficult to imagine, 3 = neither very difficult nor easy to imagine, , 4 = somewhat easy to imagine, 5 = very easy to imagine

On a 0-100 probability scale, what do you think is your chance of developing the following health conditions:
…increased hormone levels: _____ %
…cancer: _____ %
…cancer that will require invasive surgery, radiation, or chemo-therapy: _____%

MESSAGE ACCEPTANCE

How would you rate the scientific quality of the information about caffeine, hormones, and cancer that you read about? _____ 1 = very low quality, 2 = low quality, 3 = mediocre quality, 4 = high quality, 5 = very high quality

How would you rate the credentials of the researcher whose work was the basis of the information you just read? _____ 1 = very low, 2 = low, 3 = neither high nor low, 4 = high, 5 = very high

How would you rate the quality of the actual studies cited in the information you just read? _____ 1 = very low, 2 = low, 3 = neither high nor low, 4 = high, 5 = very high

How would you rate your belief in the caffeine- -cancer link you just read about? _____ 1 = do not believe at all, 2 = believe slightly, 3 = believe somewhat, 4 = believe quite a bit, 5 = believe completely

PREVALENCE:

What percentage of American women do you suspect are diagnosed with any type of cancer each year? _____

SERIOUSNESS:

How serious do you feel the information in the web article you viewed is? _____ 1 = not at all serious, 2 = slightly serious, 3 = somewhat serious, 4 = very serious, 5 = extremely serious

REACTANCE

1=agree
5=disagree

The article I read tried to manipulate me: _____

The article I read tried to make a decision for me: _____

The article I read tried to pressure me: _____

Appendix A.7

IPANAT 2
"Before continuing, please turn your attention again to another letter-rating task . Read the instructions below and respond intuitively."

(non-sense words are reversed/modified using same letters)

The following words are from an artificial language. They are intended to express various moods. In all languages, there are words that already express their meanings by the way they sound (for example, the word "rattle" sounds almost like something that rattles). For each of the following words, please rate how well each artificial word expresses different moods (for example, How much does the sound of the artificial word "FILNU" conveys each of the following moods: pleased, distressed, energetic, tense, cheerful, anxious)? Let your ratings be guided by your feelings.

		Doesn't fit at all	Fits somewhat	Fits quite well	Fits very well
	pleased	☐	☐	☐	☐
	distressed	☐	☐	☐	☐
	energetic	☐	☐	☐	☐
EMFAS	tense	☐	☐	☐	☐
	cheerful	☐	☐	☐	☐
	anxious	☐	☐	☐	☐
	pleased	☐	☐	☐	☐
	distressed	☐	☐	☐	☐
	energetic	☐	☐	☐	☐
SEKIV	tense	☐	☐	☐	☐
	cheerful	☐	☐	☐	☐
	anxious	☐	☐	☐	☐
	pleased	☐	☐	☐	☐
	distressed	☐	☐	☐	☐
	energetic	☐	☐	☐	☐
ABNUT	tense	☐	☐	☐	☐
	cheerful	☐	☐	☐	☐
	anxious	☐	☐	☐	☐
	pleased	☐	☐	☐	☐
	distressed	☐	☐	☐	☐
	energetic	☐	☐	☐	☐
LEPTA	tense	☐	☐	☐	☐
	cheerful	☐	☐	☐	☐
	anxious	☐	☐	☐	☐

		☐	☐	☐	☐
	pleased				
	distressed	☐	☐	☐	☐
	energetic	☐	☐	☐	☐
INBEL	tense	☐	☐	☐	☐
	cheerful	☐	☐	☐	☐
	anxious	☐	☐	☐	☐
		☐	☐	☐	☐
	pleased				
	distressed	☐	☐	☐	☐
	energetic	☐	☐	☐	☐
VOKUS	tense	☐	☐	☐	☐
	cheerful	☐	☐	☐	☐
	anxious	☐	☐	☐	☐

Appendix A.8

MEMORY QUIZ

"We are also interested in how much information you remember from the article. Please answer the following questions as best as you are able."

1. How many women were involved in the national health study (NHS) referenced in the article?

    a. About 800
    b. about 1000
    c. about 1200
    d. more than 1200

2.What was the occupation of the women in the NHS study that was described?

    a. teachers
    b. doctors
    c. nurses
    d. administrative hospital staff

3.Where does Dr. Joanne Kotsopolous work?

    a. Princeton Medical School
    b. Harvard Medical School
    c. University of Chicago Medical School
    d. Wash U (St. Louis) Medical School

[new question 4:]

4.What is a possible link between caffeine intake and cancer in women?

    a. Increased levels of progesterone
    b. Increased levels of testosterone
    c. Increased blood-pressure from caffeine
    d. hormones that are unrelated to cancer

5.What is the source of this article?

    a. Associated Press (AP)
    b. The National Cancer Institute (NCI)
    c. The New York Times
    d. Reuters Health

Appendix A.9

INTENTION/WILLINGNESS

We would also like to know what your expectations regarding your future health-related practices are.

Do you intend to reduce your caffeine intake in the future?

1-not at all; 5 definitely

Do you intent to reduce your caffeine intake this year?

1-not at all; 5- definitely

Imagine you have an important morning exam, but it is scheduled much earlier than you would like. Furthermore, you got up too late and are rushing to review the material while there is time left. If your friend offered to buy you a caffeinated beverage (e.g., coffee, late, soda), how WILLING would you be to take it?

1=not willing at all; 2= barely willing ; 3=somewhat willing; 4=fairly willing; 5=very willing

How interested are you in learning more about caffeine and health?

1=not at all; 5 = very much

Appendix A.10

INDIVIDUAL DIFFERENCE MEASURES

This is the final section of the study. In the pages that follow, you will see a variety of questions inquiring about your thoughts and feelings, as well as how you react to them. Please read the instructions for each one carefully and respond as honestly as you can.

1. ERQ-10

2. IPIP/Neuro-10

3. Miller/MPSS-10 [listed after this section]

4. GSES-10

5. MHLC-18

6. PF-SOC

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