

## Fear, Anger, and Risk

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Drawing on an appraisal-tendency framework (J. S. Lerner & D. Keltner, 2000), the authors predicted and found that fear and anger have opposite effects on risk perception. Whereas fearful people expressed pessimistic risk estimates and risk-averse choices, angry people expressed optimistic risk estimates and risk-seeking choices. These opposing patterns emerged for naturally occurring and experimentally induced fear and anger. Moreover, estimates of angry people more closely resembled those of happy people than those of fearful people. Consistent with predictions, appraisal tendencies accounted for these effects: Appraisals of certainty and control moderated and (in the case of control) mediated the emotion effects. As a complement to studies that link affective valence to judgment outcomes, the present studies highlight multiple benefits of studying specific emotions.

Judgment and decision research has begun to incorporate affect into what was once an almost exclusively cognitive field (for discussion, see Lerner & Keltner, 2000; Loewenstein & Lerner, in press; Loewenstein, Weber, Hsee, & Welch, 2001; Lopes, 1987; Mellers, Schwartz, Ho, & Ritov, 1997). To date, most judgment and decision researchers have taken a valence-based approach to affect, contrasting the influences of positive-affect traits and states with those of negative-affect traits and states (for reviews reaching this conclusion, see DeSteno, Petty, Wegener, & Rucker, 2000; Elster, 1998; Forgas, 1995; Lerner & Keltner, 2000).<sup>1</sup> For example, one influential study found that participants induced to feel negative affect consistently made more pessimistic estimates about frequencies of death than did participants induced to feel positive affect (E. J. Johnson & Tversky, 1983). This prototypic valence finding—that the presence of a (negative or positive) mood or disposition increases frequency estimates for similarly valenced events—reliably replicates across diverse tasks (e.g. Bower, 1991; Isen, Shalcker, Clark, & Karp, 1978; Kavanagh & Bower, 1985; Mayer, Gaschke, Braverman, & Evans, 1992; Mayer & Hanson, 1995; Schwarz & Clore, 1983; Wright & Bower, 1992).

In the present studies we follow the valence tradition by examining the striking influence that feelings can have on normatively unrelated judgments and choices. We diverge in an important way, however, by focusing on the influences of specific emotions rather than on global negative and positive affect (see also Bodenhausen, Sheppard, & Kramer, 1994; DeSteno et al., 2000; Keltner, Ellsworth, & Edwards, 1993; Lerner & Keltner, 2000). We develop an overarching appraisal-tendency framework that generates predictions concerning the influences of specific emotional states and dispositions on judgment and choice. Our goals are twofold: to improve the power and precision of judgment and decision models addressing risk and to identify mechanisms through which specific emotion states and dispositions influence (normatively) unrelated judgments and decisions.

### An Appraisal-Tendency Approach to Affect and Judgment

We have proposed an appraisal-tendency framework that links emotion-specific appraisal processes to a broad array of judgment and choice outcomes (see Lerner & Keltner, 2000). Two assumptions motivate our approach. First, we assume that emotions trigger changes in cognition, physiology, and action that, although tailored to help the individual respond to the event that evoked the emotion, often persist beyond the eliciting situation. These emotion-related processes guide subsequent behavior and cognition in goal-directed ways, even in response to objects or events that are unrelated to the original cause of the emotion (e.g., see Gasper & Clore, 1998; Goldberg, Lerner, & Tetlock, 1999; Lerner, Goldberg, & Tetlock, 1998; Raghunathan & Pham, 1999; Weiner, 1986).

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<sup>1</sup> We define trait emotions as enduring tendencies (dispositions) to experience particular emotions. State emotions are momentary experiences of an emotion. Consistent with theoretical and empirical work in this area, we assume that trait emotions predispose one to experience the corresponding emotional states with heightened intensity and frequency (see Gross, Sutton, & Ketelaar, 1998; Larsen & Ketelaar, 1989; Lazarus, 1994).

Second, we assume that emotions are associated with specific appraisals (see Lazarus, 1991; Ohman, 1993; Ortony, Clore, & Collins, 1988; Roseman, 1984; Scherer, 1999; Smith & Ellsworth, 1985; Weiner, Graham, & Chandler, 1982). These appraisals reflect the core meaning of the event that elicits each emotion (Lazarus, 1991) and, we hypothesize, determine the influence of specific emotions on social judgment. In the present work, we draw mainly on Smith and Ellsworth's (1985) theory, which systematically integrates several other appraisal theories (e.g., Roseman, 1984; Scherer, 1982) and differentiates six cognitive dimensions underlying different emotions.<sup>2</sup> It is important to note that their analysis reveals that emotions of the same valence differ on multiple appraisal dimensions. For example, fear and anger, although both negative, differ in terms of the certainty and control dimensions. Whereas a sense of situational control and uncertainty defines fear, a sense of individual control and certainty defines anger.

Taken together, these two assumptions lead us to hypothesize that each emotion activates a predisposition to appraise future events in line with the central appraisal dimensions that triggered the emotion (for boundary conditions, see Lerner & Keltner, 2000). We call this process an *appraisal tendency*. Just as emotions include "action tendencies" that predispose individuals to act in specific ways to meet environmental problems and opportunities (see Frijda, 1986), emotions likewise predispose individuals to appraise the environment in specific ways toward similar functional ends. In the case of dispositional emotion, this predisposition may be especially difficult to regulate. Gasper and Clore (1998) have shown, for example, that dispositionally anxious individuals rely on feelings of state anxiety to inform subsequent judgments even if the anxious individuals have attributed their state anxiety to a judgment-irrelevant source.

An appraisal-tendency perspective generates several testable propositions (see Lerner & Keltner, 2000). Each emotion's central appraisal theme defines the content of the effects of emotion on judgment and choice. This appraisal theme also determines which judgments and choices different emotions are likely to influence. An emotion exerts strong influences on judgment and choice domains that relate to the appraisal theme of the emotion. The methodological implications are equally clear: Studies should compare emotions that are highly differentiated in their appraisal themes on judgments and choices that relate to that appraisal theme (e.g., see Keltner, Ellsworth, & Edwards, 1993).

Motivated by these assumptions, we conducted an initial test of the appraisal-tendency hypothesis by examining risk perception among dispositionally fearful and angry individuals (see Lerner & Keltner, 2000). Fear and anger, as outlined earlier, differ markedly in the appraisal themes of certainty and control. Certainty and control, in turn, resemble cognitive metafactors that determine judgments of risk, namely *unknown risk* (defined at the high end by hazards judged to be uncertain) and *dread risk* (defined at the high end by perceived lack of individual control; McDaniels, Axelrod, Cavanagh, & Slovic, 1997; Slovic, 1987). Fear and anger, we reasoned, should therefore exert different influences on risk perception and preference. The results of this initial test support the appraisal-tendency hypothesis: Fearful people made pessimistic risk assessments, whereas angry people made optimistic risk assessments (see Lerner & Keltner, 2000).

## The Present Studies

In the present studies, we extended our initial test of the appraisal-tendency hypothesis in several ways. First, we examined whether dispositional fear and anger would influence a wider array of judgments and choices (e.g., risk preferences, optimism, judgments relevant to the self or not). Second, because individual-differences studies (Studies 1–3) raise questions about causality, in Study 4 we addressed whether experimentally induced fear and anger would cause different patterns of risk perception. Finally and perhaps most important, we sought to document that appraisal themes account for the influences of different emotions on judgment and choice. Previous studies have documented specific emotion–judgment relations (e.g., Keltner, Ellsworth, & Edwards, 1993; Lerner & Keltner, 2000) without providing evidence for the mediating processes that produce emotion–judgment relations. In the present investigation, we pursued three strategies to directly assess our hypothesis that appraisal themes mediate the relationship between emotion and judgment. In Study 2 we relied on a strong inference approach, strategically comparing two emotions (anger and happiness) that differ in valence but have similar appraisal themes. This allowed us to infer whether the appraisal themes of certainty and control or valence would have greater influence on risk perception. In Study 3 we explored boundary conditions of fear- and anger-related appraisal tendencies, hypothesizing that dispositional anger and fear would only influence judgments that are ambiguous with respect to certainty and control. In Study 4 we gathered direct evidence concerning whether certainty and control mediate the relationships between the target emotions (fear and anger) and risk perception.

### Study 1: Fear, Anger, and Risk Preferences

Since Tversky and Kahneman's (1981) seminal work on risk-preference reversals, the influence of framing on risk preferences has proven to be a remarkably robust finding (for a review, see Dawes, 1998). Consider Tversky and Kahneman's (1981) widely used "Asian disease problem." In a within-subject design, participants are asked to imagine that the United States is preparing for the outbreak of an unusual Asian disease that is expected to kill 600 people. Two alternative programs to combat the disease are proposed (A and B). Under the gain frame, participants read that the exact scientific estimates of the consequences are as follows: "If Program A is adopted, 200 people will be saved. If Program B is adopted, there is a 1/3 probability that 600 people will be saved

<sup>2</sup> Using a within-subject design, Smith and Ellsworth (1985) asked participants to recall experiences of 16 different emotions, which participants then rated on dimensions derived from appraisal theories of emotion. They found, for example, that happiness was associated with high pleasantness, medium self-responsibility, high certainty, medium attention, low effort, and low situational control. Fear, by contrast, was associated with low pleasantness, low self-responsibility, very low certainty, medium attention, high effort, and high situational control (Smith & Ellsworth, 1985). A discriminant analysis revealed that 15 emotions were correctly predicted over 40% of the time by the corresponding patterns of cognitive appraisal for the six dimensions identified in the responses (certainty, pleasantness, attentional activity, control, anticipated effort, and responsibility).

and a 2/3 probability that no one will be saved." Under the loss frame, participants learn that "if Program C is adopted, 400 people will die. If Program D is adopted, there is a 1/3 probability that nobody will die and a 2/3 probability that 600 people will die."

Although a preference for the certain "risk-averse" option (Program A under the gain frame) should lead someone to prefer the equivalent option under the loss frame (Program C), the norm is for people to select A under gain frames and D under loss frames. Across investigations, an average of 70–80% of respondents become risk seeking (i.e., choose the gamble) when the above choices are framed as losses and become risk averse (i.e., choose the certain outcome) when identical choices are framed as gains. In sum, a certainty effect occurs, wherein sure gains are sought and sure losses are avoided.

By behavioral science standards, framing effects are exceptionally large and reliable (for a review, see Dawes, 1998). One might suppose, therefore, that framing effects would overwhelm any individual differences in attitudes toward risk. Recent evidence suggests otherwise. For example, when risk perception and risk preferences are unconfounded (for discussion, see Weber, 1997; Weber & Millman, 1997), some individuals reliably choose options that they perceive to be less risky, even though the choices would not be considered risk averse if the expected values of those choices were calculated (Mellers, Schwartz, & Weber, 1997). In addition, Lopes and colleagues (Lopes, 1987; Lopes & Oden, 1999) have predicted and found individual differences in attitudes toward risk, such as tendencies to focus on potential "worst case" outcomes.

Consistent with these considerations, we posit that individual differences in emotion will influence outcomes and that these influences will hold across framing conditions. More specifically, the sense of certainty and control associated with anger should lead angry individuals to make risk-seeking choices across frames. The sense of uncertainty and lack of control associated with fear should lead fearful individuals to make risk-averse (certainty enhancing) choices across frames. It is important to note that a valence approach would reach a different prediction. According to this view, fear and anger should be associated with risk aversion across frames.

## Method

### Participants and Overview

Seventy-five undergraduates (20 men, 55 women) participated in return for course credit.<sup>3</sup> Participants were run in small groups; they completed all questionnaires individually. To dissociate the affect measures from the risk preference measures, we told participants that different researchers had pooled together their respective questionnaire packets. The first packet, a "Self-Evaluation Questionnaire," contained measures of baseline state emotions and dispositional emotions. (Variance in baseline affect was in the predicted directions and did not qualify any of the main findings.) After completing the packet, participants received a separate questionnaire containing the dependent measure (risk preference) with the embedded within-subject framing manipulation. A variety of filler questionnaires on unrelated topics (e.g., potential causes for various events) followed the dependent measure.

### Procedure and Materials

**Fear measures.** We administered two complementary measures of dispositional fear: (a) a 12-item version of the Fear Survey Schedule-II (developed by Bernstein & Allen, 1969; Geer, 1965; Suls & Wan, 1987), and (b) Spielberger's (1983) 20-item trait-anxiety scale. The Fear Survey assessed the degree of fear, if any, participants typically feel in response to 12 specific situations or objects (e.g., enclosed places, snakes). The anxiety scale assessed the frequency with which participants feel diverse forms of anxiety (e.g., "nervous," "restless," or "like a failure"). Although the two measures addressed somewhat different content domains, the Pearson correlation between the two was reasonably high ( $r = .54, p < .01$ ). To combine the two measures into one composite index of dispositional fear, we used principal-components analysis and imposed a one-factor solution that retained all items (eigenvalue = 10.78). We then calculated standardized regression factor scores for each participant. The composite fear scale achieved an alpha level of .91.

**Anger measures.** We also used two complementary measures of dispositional anger: (a) Spielberger's (1996) 10-item trait-anger scale, and (b) a 10-item face-valid anger scale (for scale properties, see Lerner & Keltner, 2000). The Spielberger scale assesses the frequency of experiencing reactive and intense anger; the Lerner and Keltner (2000) scale assesses the degree to which respondents consider chronic anger to be a stable, self-defining characteristic. After observing a reasonably high correlation ( $r = .69, p < .01$ ) between the measures, we combined the two measures into one composite index of dispositional anger using a principal-components solution that retained all items (eigenvalue = 6.72). We then calculated standard regression factor scores for each participant. The composite anger scale achieved an alpha level of .84.

**Framing manipulation.** To examine the joint influence of emotion and decision frame on risk preferences, we manipulated framing using the Asian disease problem described above. For each set of alternatives, participants indicated the extent to which they would favor one option over the other, if at all. Response options ranged from 1 (*very much prefer Program A*) to 6 (*very much prefer Program B*). The order in which participants received each frame was counterbalanced, and each participant was exposed to both levels of the within-subject manipulation. Finding no effect for the order of exposure to levels of the framing manipulation, however, we did not retain the order variable in subsequent analyses.

## Results and Discussion

### Preliminary Analyses

Consistent with the fact that fear and anger share a common valence, a significant correlation emerged between the composite dispositional scales for fear and anger ( $r = .49, p < .05$ ). In the inferential analyses we therefore controlled for the influence of one emotion to ascertain the independent relationship between the other emotion and risk preference.

### Inferential Analyses

Recall the valence prediction that fearful and angry individuals will make risk-averse choices across gain and loss frames when compared with individuals who are low in dispositional fear and anger. The appraisal-tendency approach generates the same pre-

<sup>3</sup> We tested whether gender of participant would qualify any of the inferential analyses in each of the three studies. Finding no significant interactions in any of the studies, we collapse all results across men and women.

diction for fearful individuals. However, it differs for angry individuals, predicting that they will make risk-seeking choices across frames.

To assess the relationships among fear, anger, framing, and the Likert preferences of respondents, we followed Judd and McClelland's (1989) procedure for mixed design regression.<sup>4</sup> The first model regressed the average of the respondents' preferences on the fear measure and the anger measure. In support of the appraisal-tendency hypotheses, the more fear participants reported, the more likely they were to choose the sure thing ( $B = -0.19$ ,  $t(72) = -1.70$ ,  $p < .05$ , one-tailed). Also supporting the appraisal-tendency hypotheses, the more anger participants reported, the more likely they were to choose the gamble ( $B = 0.24$ ,  $t(72) = 2.11$ ,  $p < .05$ , one-tailed). Essentially, fearful people avoided uncertainty, whereas angry people embraced the risks, and these patterns held independent of framing.

Following Judd and McClelland (1989), the second model regressed the difference ( $1/2 \times [\text{loss frame} - \text{gain frame}]$ ) of the respondents' preferences on the same two explanatory variables. As expected, there was a strong framing effect ( $B = 0.42$ ,  $t(72) = 6.16$ ,  $p < .01$ ). It is important to note that the absence of a significant fear interaction with framing ( $B = -0.04$ ,  $t(72) = -0.50$ ,  $p > .5$ , and of a significant anger interaction with framing ( $B = 0.13$ ,  $t(72) = 1.62$ ,  $p = .11$ , implies that the respective fear and anger patterns reported above hold across framing conditions. Exploratory examination of these patterns within each frame (see Figure 1) does, however, reveal stronger relations under the loss frame than under the gain frame. The relative strength of relations under the loss frame is consistent with the fact that when all other things are equal, negative information has a stronger effect than does positive information (Taylor, 1991). Indeed, the fact that loss looms larger than gain (Kahneman & Tversky, 1979; Tversky & Kahneman, 1984) may have amplified the general tendency for angry individuals to seek risks and fearful individuals to avoid them. An alternative but unlikely possibility is that fear and anger mainly bias the interpretation of negative information—a possibility we explore in subsequent studies.

Having found initial support for the appraisal-tendency hypothesis, we address questions of extension and replication in Study 2. Specifically, (a) Do the diverging patterns for fear and anger hold across a range of judgment and choice tasks, or do they only hold in tasks that are similar in form to the Asian disease problem (wherein probabilities are known and choice outcomes are of little personal relevance)? (b) Do certainty and controllability account for the diverging influences of fear and anger? As a subordinate goal, we also question whether fear and anger influences are limited to the interpretation of negative information.

### Study 2: Fear, Anger, Happiness, and Optimistic Risk Perceptions

In Study 2 we examine fear and anger influences in a more realistic and frequent type of life task: making risk assessments when probabilities are unknown and when outcomes are personally relevant. Specifically, participants predicted the likelihood that specific positive and negative events would occur in their own life compared with the lives of relevant peers.

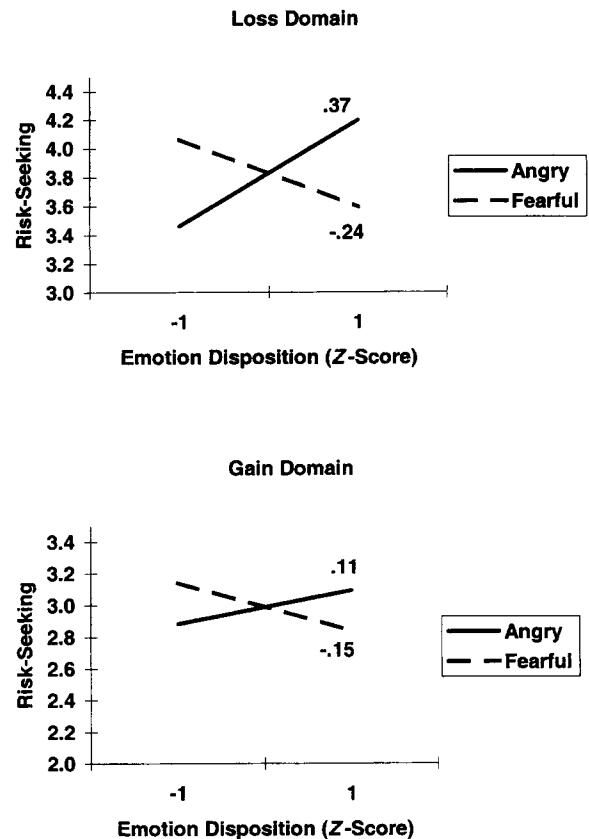


Figure 1. In the loss domain, angry individuals made risk-seeking choices and fearful individuals made risk-averse choices (top panel). A similar pattern emerged in the gain domain: Angry individuals made risk-seeking choices and fearful individuals made risk-averse choices (bottom panel). The values are standardized beta coefficients.

Study 2 also takes a step toward determining whether the appraisal themes of certainty and control account for the influences of fear and anger on judgment. In Studies 2 and 3 we added dispositional happiness as an independent variable, which allowed us to contrast a valence prediction with an appraisal-tendency prediction. Happiness, although of positive valence, is associated with appraisals of elevated certainty and individual control, as is anger (Smith & Ellsworth, 1985). Thus, if certainty and control account for the influences of dispositional emotions on judgment, as an appraisal-tendency perspective predicts, then both happy individuals and angry individuals should make relatively optimistic risk assessments. Only fearful individuals should make relatively pessimistic risk assessments. By contrast, if valence matters most, then only happy individuals should make optimistic risk assessments. The assessments of fearful individuals should closely resemble those of angry individuals. Finally, a subordinate goal was to examine whether fear and anger differences would emerge on both negative and positive outcomes.

<sup>4</sup> Because this analysis attaches an interpretive meaning to the intercept term, it precluded use of standardized beta values. The beta values for this analysis follow the 1–6 scale from the Likert responses.

## Method

### Participants and Procedural Overview

Six hundred one undergraduates (320 women, 281 men) anonymously completed the questionnaires in return for course credit. Study 2 used almost the same procedure as Study 1 did. The only difference was that respondents completed the questionnaires at home (as part of a mass prescreening in the psychology department) rather than in class. Respondents returned the questionnaires within 2 weeks after receiving them.

### Procedure and Materials

**Fear measure.** We measured dispositional fear with the same subscales as in Study 1. As before, the correlation between the Fear Survey and the trait anxiety measure was significant,  $r = .57, p < .01$ . To create a composite index of dispositional fear, we again (a) calculated a principal-components analysis and imposed a one-factor solution that retained all items (eigenvalue = 7.90) and (b) calculated standard regression factor scores for each participant. The composite fear scale achieved an alpha level of .89.

**Anger measure.** To allow enough time for participants to complete the additional happiness measure (see below), we only included Spielberger's (1996) trait-anger scale. To create the dispositional anger scale, we calculated a principal-components analysis of the trait-anger items, imposed a single-factor solution (eigenvalue = 3.52), and then calculated standard regression factor scores for all participants. The dispositional anger scale achieved an acceptable level of reliability ( $\alpha = .84$ ).

**Happiness measure.** We measured happiness with an abbreviated version of Underwood and Froming's (1980) mood survey. The abbreviated version consisted of six face-valid items (e.g., "I consider myself a happy person") that measured the chronic tendency to feel happy. The four-point Likert response scale ranged from 1 (*almost never*) to 4 (*almost always*). As before, we used principal-components analysis to calculate standard regression scores for each participant (eigenvalue = 3.20). The scale achieved an acceptable level of reliability ( $\alpha = .81$ ).

**Optimistic perception measure.** We used Weinstein's (1980) measure of optimism, asking participants to estimate their own chances of experiencing 26 future life events relative to the average chances of same-sex students at their own university. All of the items described events that could potentially happen to a student from their university, either now or at some later point in life. Half of the events were positive (e.g., "I married someone wealthy" and "My work received an award"), and half were negative (e.g., "I contracted a sexually transmitted disease" and "I divorced within 7 years after marrying"). The 8-point response scale ranged from -4 (*very much less likely*) to 4 (*very much more likely*).

## Results and Discussion

### Preliminary Analyses

Preliminary analyses on the dependent measure showed that ratings for the positive and negative events (reverse scored) were significantly correlated ( $r = .15, p < .01$ ). To explore the possibility of combining all optimism items, we loaded all 26 items into one optimism factor. This factor created a scale with good reliability ( $\alpha = .80$ ). To explore the possibility that fear and anger might only alter the interpretation of negative events, we also created two subfactors for optimism, one for the 13 (reverse scored) negative events ( $\alpha = .77$ ), and one for the 13 positive events ( $\alpha = .80$ ).

On the independent variable side, a significant positive relation emerged between the composite fear and anger measures ( $r = .34,$

$p < .05$ ). Dispositional happiness was also negatively correlated with fear ( $r = -.66, p < .05$ ) and anger ( $r = -.25, p < .05$ ).

### Inferential Analyses

To control for the influence of each emotion disposition on the two others, we simultaneously entered each emotion factor into one regression equation. In light of the strong scale reliability, this equation used the optimism factor that combined all 26 (positive and negative) events for the outcome of interest. In support of the appraisal-tendency prediction, (a) anger was positively related to optimistic risk estimates ( $B = 0.13, t(598) = 3.43, p < .05$ ), (b) happiness was positively related to optimistic risk estimates ( $B = 0.15, t(598) = 3.04, p < .05$ , and (c) fear was negatively related to optimistic risk estimates ( $B = -0.38, t(598) = -7.52, p < .01$  (see Figure 2). As the above results suggest, follow-up analyses revealed no support for the idea that fear and anger might only bias the interpretation of negative events. The same patterns observed for the combined (26-item) factor also held for the valence-specific outcomes. Given that the patterns were essentially the same, we report the more parsimonious models that combine positive and negative events.

In sum, although Study 2 used a different judgment paradigm than did Study 1, we again observed that fear and anger were associated with divergent judgments. Specifically, the differences observed for fear and anger influenced not only choices with known probabilities and little personal consequence (as in Study 1) but also judgments with unknown probabilities and real personal consequence (as in Study 2). This indicates that the perceptual differences between fear and anger may be somewhat general. Indeed, these patterns even applied across target-event valence (to positive and negative events). Perhaps most important, Study 2 reveals that the judgments of angry individuals closely resembled the judgments of happy individuals. These counterintuitive findings are consistent with the idea that appraisals of certainty and

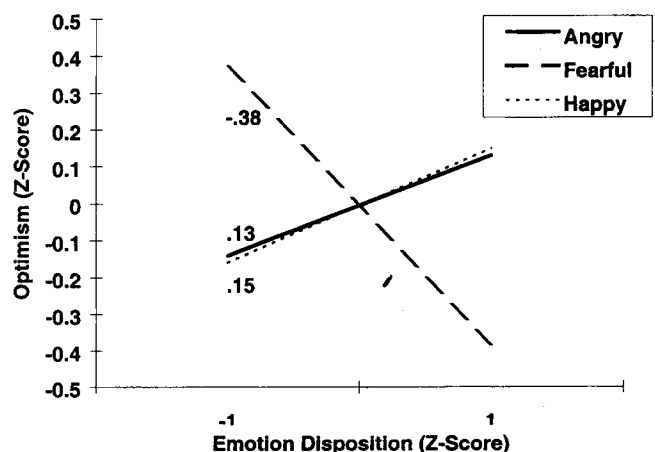


Figure 2. Increasing anger and increasing happiness were similarly related to increasing optimism about future life events. (In fact, the lines virtually overlap.) Increasing fear, by contrast, was related to increasing pessimism about future life events. (Values are standardized beta coefficients.)

control rather than valence account for the influences of dispositional fear, anger, and happiness on judgment.

### Study 3: Do Appraisals of Certainty and Control Moderate the Influences of Fear and Anger on Judgment and Choice?

In Study 3 we address three goals. First, to address the reproducibility of the rather counterintuitive findings from Study 2, we assess emotion dispositions in a different way. Rather than statistically controlling for the influence of each emotion disposition on the others (as in Studies 1 and 2), we recruited three discrete groups representing the three target emotion dispositions. In taking this person-centered rather than variable-centered approach, we gathered emotion disposition measures in an entirely different context than the judgment measures (separated by 6–8 weeks), reducing concerns that the completion of the emotion-disposition measures might contaminate responses to the judgment task.

Second, to more directly address the role of appraisal themes, we manipulated (within subject) the extent to which events to be judged were ambiguous or unambiguous regarding controllability and certainty. We did so because the priming literature suggests that subconsciously primed constructs exert influence when judgment targets are ambiguous with respect to the primed dimension (see Uleman & Bargh, 1989). By extension, if appraisal tendencies regarding certainty and controllability operate as primed perceptual lenses, then the degree of certainty and controllability associated with target events should moderate the influence of fear and anger on judgments of risk. Specifically, optimism differences between fearful and angry individuals should emerge most strongly when participants judge events that are ambiguous in terms of controllability and predictability. In this case, the ambiguous events should serve as inkblots that are open to interpretation (see Darley & Gross, 1983). For events that are clearly controllable and certain (or clearly uncontrollable and uncertain), by contrast, appraisal tendencies should not shape judgments. In such cases, appraisal tendencies for certainty and control become moot because the judgment target is unambiguous with respect to these dimensions. In addition, under these circumstances we expect that other appraisal dimensions with relevance to risk, such as valence, will be the most likely determinants of the emotion–judgment relationships. In other words, we expect that certainty and controllability will play a primary role in shaping judgments of risk, given their documented role in the cognitive literature on risk (see Slovic, 1987). When the relevance of these dimensions is experimentally blocked (as in unambiguous targets), dimensions of secondary importance (i.e., valence) will influence the judgments.

Finally, a subordinate goal of Study 3 is to assess whether certainty and controllability should be empirically parsed. Conceptually, they should be distinguishable (see Smith & Ellsworth, 1985). Empirically, we expect that the degree of overlap between controllability and certainty depends on the particular target events being judged. For some life events certainty and controllability correlate; for others they do not.

## Method

### Pretesting

To test the moderator hypothesis, we first measured the extent to which the target events were ambiguous or unambiguous with respect to the certainty and control dimensions. To ensure that ratings on one dimension would not contaminate ratings on the other, we had two separate groups of pretest participants rate the 26 life events in Weinstein's (1980) scale. One group ( $N = 26$ ) completed the controllability questionnaire; a separate group ( $N = 20$ ) completed the certainty questionnaire. Participants were given the following instructions before rating each of the 26 events on a 6-point scale:

We are interested in the fact that there are some life events that many people perceive to be certain/predictable (controllable), such as brushing your teeth. There are other events, however, that many people perceive to be uncertain (uncontrollable), such as earthquakes. For each of the items below, we would like you to indicate the extent to which the event seems to be certain (controllable) by writing in a number ranging from 1 (*not at all certain/controllable*) to 6 (*completely certain/controllable*).

Results revealed that perceived controllability of events correlated strongly with perceived certainty of events ( $r = .76, p < .05$ ). We therefore averaged the two ratings for each event into one index of controllability and certainty. We then performed a tertiary split on this composite index, producing the following three groups of events: (a) events that are clearly uncontrollable and uncertain, (b) events that are ambiguous regarding controllability and certainty, and (c) events that are clearly controllable and certain. Finally, we combined the two extreme groups (clearly controllable and certain and clearly uncontrollable and uncertain) to create one group of events that are unambiguous regarding controllability and certainty. These two groups form the two levels of the within-subject manipulation: events that are ambiguous with respect to controllability and certainty, and those events that are unambiguous on these two dimensions. Appendix A lists the events included in each category.

### Participants

In a prescreening packet distributed to undergraduates in psychology classes, we administered the same fear, anger, and happiness measures as we used in Study 2. On the basis of responses to those measures, we selected three groups of respondents to participate in Study 3. We created a purely anger-prone group ( $n = 43$ ) by randomly selecting participants from all those who scored more than one standard deviation above the mean on dispositional anger and less than one standard deviation above the mean on the other two emotion dispositions. We similarly created a purely fear-prone group ( $n = 41$ ) by randomly selecting participants who scored more than one standard deviation above the mean on the measure of dispositional fear and not on the other emotions. Finally, we created a purely happiness-prone group ( $n = 34$ ) using the same procedure for target and nontarget emotion scores.

### Procedural Overview and Design

Participants were recruited over the telephone for a study on "information processing." When they arrived at the lab, a same-sex experimenter who was unaware of emotion condition and ambiguity-of-event condition greeted participants. The experimenter sat across a table from the participant, explained the procedure, and then had the participant indicate his or her responses to Weinstein's (1980) optimism questionnaire in a face-to-face interview. Specifically, the experimenter first read three practice items and then began with the first item of the actual questionnaire. The order of

items on the questionnaire was counterbalanced between participants. Participants responded orally to each item with a number from the 8-point response scale, which ranged from  $-4$  (*very much less likely*) to  $4$  (*very much more likely*). We thought that having participants respond orally rather than in an anonymous self-report form might reduce the tendency for happy and angry individuals to see themselves as comparatively less vulnerable to negative life events. In sum, Study 3 took the form of a  $2$  (event: ambiguous certainty and controllability, unambiguous certainty and controllability)  $\times 2$  (order: ambiguous first, unambiguous first)  $\times 3$  (emotion disposition: fear, anger, happiness) mixed-model factorial design. Events and order were within-subject factors, and emotion disposition was a between-subjects factor.

### Results and Discussion

Preliminary analyses revealed that the order of events in the questionnaire did not affect the results. It was, therefore, not retained in subsequent analyses.

The same counterintuitive pattern from Study 2 replicated in the present study. A one-way analysis of variance testing the influence of emotion disposition (fearful, angry, happy) on optimism was significant,  $F(2, 116) = 4.24, p < .05$ . Fearful individuals were less optimistic than were angry individuals ( $M_s = -0.33$  and  $0.01$ , respectively),  $t(82) = -1.61, p < .055$ . In addition, angry individuals were less optimistic than happy individuals, but not significantly so ( $M = 0.30$ ),  $t(75) = -1.42, p = .08$ .<sup>5</sup> In sum, fear and anger differences persisted despite the public nature of the response format. This persistence suggests that the differences between fear and anger are reliable across contexts. Individual differences in emotion were not diminished even when a potential "social reality factor" (i.e., telling estimates to an experimenter) was introduced.

We next addressed the moderator hypothesis, testing whether the optimism difference between fear and anger would only be observed when participants were rating events that were ambiguous with respect to controllability and certainty. A planned interaction contrast with emotion disposition (fearful, angry) and nature of event (ambiguous, unambiguous) revealed a significant interaction between the two variables,  $F(1, 82) = 7.98, p < .01$ . To explore this interaction, we conducted analyses of simple effects at each level of ambiguity. Consistent with the appraisal-tendency prediction, angry individuals made significantly more optimistic estimates than did fearful individuals, but only when considering ambiguous events,  $t(82) = -2.57, p < .01$ . When considering unambiguous events, angry individuals made estimates that were as pessimistic as were those of fearful individuals,  $t(82) = 0.03, p > .10$ . A planned interaction contrast with emotion disposition (happy, angry) and nature of event (ambiguous, unambiguous) revealed a significant interaction between these two variables as well,  $F(1, 75) = 4.86, p < .05$ . To explore this interaction, we again conducted analyses of simple effects at each level of ambiguity. Consistent with the appraisal-tendency prediction, angry individuals made significantly less optimistic estimates than did happy individuals only when considering unambiguous events,  $t(75) = -2.53, p < .05$ . By contrast, when considering ambiguous events, angry individuals made estimates that were as optimistic as those of happy individuals were,  $t(75) = -0.41, p > .10$ . The relevant means are represented in Figure 3.

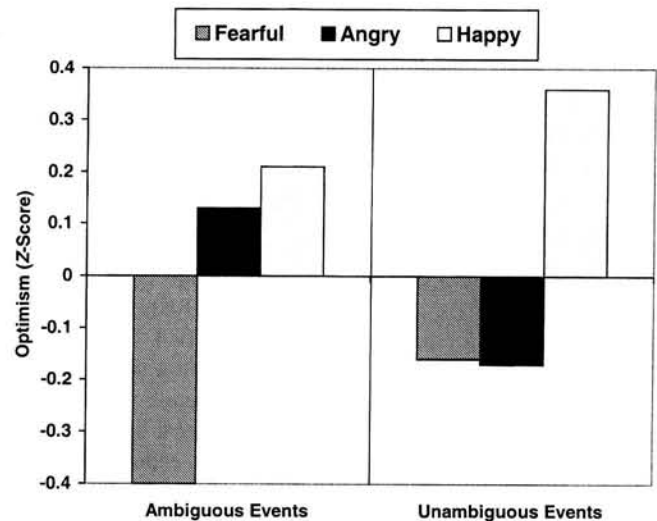


Figure 3. When judgment targets were ambiguous with respect to controllability and certainty, appraisal-tendency differences emerged between fearful and angry individuals; when judgment targets were unambiguous, these differences disappeared and emotional valence predicted optimistic risk estimates.

It is important to recall that the key dimensions known to drive risk estimates are controllability and certainty or (in other terms) dread risk and unknown risk (see Slovic, 1987). When target events were ambiguous regarding these dimensions, fear and anger differentially influenced optimism. This is consistent with the idea that when events are ambiguous with respect to primed constructs, they serve as inkblots for contrasting interpretations (see Darley & Gross, 1983). When events were unambiguous, however, no optimism differences between fear and anger emerged; instead, the emotion's valence shaped optimism. These results highlight a unique advantage of an appraisal-tendency approach. It allows one to predict with increasing precision when particular appraisal dimensions of emotional experience (e.g., valence) shape judgment outcomes and when other dimensions of emotion (e.g., certainty and control) shape outcomes. In sum, we do not contend that certainty and controllability are generally more important than valence is. Rather, we contend that situations and judgment tasks moderate the importance of any given emotion dimension. Under some circumstances, valence drives decisions; under other circumstances, other dimensions do. An appraisal-tendency framework allows one to predict which dimensions will matter for which judgments and decisions.

### Study 4: Effects of Induced Fear and Anger on Optimistic Risk Perception

Thus far, we have shown that dispositional fear and anger have opposite patterns of association with risk perceptions and preferences. These patterns held across distinct judgment and choice tasks and changed in predicted ways, depending on whether the

<sup>5</sup>  $t$  tests were one-tailed; hypotheses and comparisons were planned.



target events were ambiguous with respect to certainty and control. Our use of individual-differences (correlational) methods, however, leaves open the possibility that unmeasured variables might account for the observed relations between dispositional emotion and judgment. For example, different life experiences might predispose fearful and angry people to evaluate risk in different ways. If so, the relations between emotion dispositions and judgments and choices might be artifacts of their common relation to a life-experience variable. Similarly, although the anger group in Study 3 scored higher on optimism than did the fear group (for ambiguous events), the discrete-groups approach in Study 3 did not allow us to pinpoint the locus for this effect. Did these patterns emerge because the participants are high in anger or because they are low in some combination of happiness and fear?

Our previous studies also did not directly document the mediating role of appraisal themes, which is a core assertion of our appraisal-tendency approach. To address the concern about confounding third variables, Study 4 manipulates fear and anger rather than measuring chronic tendencies to experience fear and anger. To address concerns about whether appraisal tendencies mediate the influences of fear and anger, Study 4 also directly assesses participants' appraisals and examines whether such appraisals accounted for the observed emotion effects on judgment.

## Method

### Pretesting of Emotion Inductions

Because labeling state emotions reduces their impact on judgment (Keltner, Locke, & Audrain, 1993), we did not want to have participants self-report their emotions in a manipulation check. We therefore conducted a pretest to assess the effectiveness of the inductions. Fourteen participants were randomly assigned to a fear condition or an anger condition. Ostensibly a study about imagination and information processing, the emotion induction instructed participants to answer two open-ended questions as truthfully as possible and to provide as much detail as possible. The first question asked participants to briefly describe three to five things that make them most angry (fearful). The second question asked participants to describe in more detail "the one situation that makes you, or has made you, most angry (afraid)." Participants were told to write their description so that someone reading it might even get mad (in the case of fear, become afraid) just from learning about the situation. Immediately after the induction, participants completed a commonly used emotion self-report form in which they rated the extent to which they felt each of 16 separate emotion terms (*amused, angry, anxious, disgusted, downhearted, engaged, fearful, frustrated, happy, joyful, interested, irritated, nervous, mad, repulsed, and sad*; see Goldberg et al., 1999; Gross & Levenson, 1995; Lerner et al., 1998). To obtain a composite measure of fear, we averaged responses for the *fear, anxiety, and nervous* items (scale  $\alpha = .95$ ). We also averaged the *anger and mad* items to form a composite anger measure (scale  $\alpha = .90$ ).

Of the 14 participants, 1 was dropped before analyses for failing to follow instructions (i.e., writing only a one-sentence response with no details). Independent sample *t* tests on responses from the remaining participants confirmed that the manipulations were effective. Participants in the fear condition ( $n = 7$ ) reported experiencing significantly more state fear than did participants in the anger condition ( $n = 6$ ),  $t(11) = 1.86, p < .05$ , one-tailed (respective *M*s = 4.86 vs. 2.28; respective *SD*s = 2.63 vs. 2.30). Similarly, participants in the anger condition reported experiencing significantly more state anger than did participants in the fear condition,  $t(11) = -1.89, p < .05$ , one-tailed (respective *M*s = 5.50 vs. 3.21; respective *SD*s = 1.58 vs. 2.56). No other significant emotion differences

emerged between the fear and anger conditions, suggesting that the manipulation was sufficiently focused.

### Participants and Overview for Study 4

Sixty-three undergraduate students were randomly assigned to the fear condition or the anger condition. As in the pretest, participants expected to complete a questionnaire-based study about imagination and information processing. Participants completed an initial questionnaire assessing baseline state affect before engaging in the emotion induction and completing questionnaires assessing optimism and appraisals of certainty and control. Participants completed the questionnaires in visually isolated cubicles.

### Stimulus Materials and Procedure

**Baseline affect.** Because we conducted the study in close temporal proximity to final exams, we suspected—and sought to control for—baseline differences in such state emotions as anxiety and anger. We therefore assessed baseline positive and negative affect using the Positive and Negative Affect Scale (PANAS; see Watson, Clark, & Tellegen, 1988), which consists of 24 emotion terms on which participants indicate their present feelings (1 = *very slightly or not at all*, 5 = *extremely*). We combined all positive items from the PANAS into one positive-affect factor (eigenvalue = 5.78, 48% of variance explained). Using principal-components analysis, we combined all anger-related items (*hostile and irritable*) into one anger factor (eigenvalue = 1.49, 74% of variance explained). We also combined all fear-related items (*scared, nervous, and afraid*) into a fear factor (eigenvalue = 2.15, 72% of variance explained).

**Emotion induction.** We followed the same emotion-induction procedures as in the pretest, randomly assigning the participants to each of the conditions. To ensure that participants followed instructions in the induction, one independent judge who was unaware of condition coded the written responses (scores of 1 indicated that the participant had followed instructions; scores of 2 indicated that participants did not follow instructions, either because they wrote an insufficiently short response without details or because they wrote a response with no emotional content). Three participants with scores of 2 were dropped from the study, leaving 60 participants in the final sample. Two independent judges who were unaware of condition also coded the extent to which participants engaged in the writing task (1 = *low emotional intensity*, 3 = *high intensity*).

**Optimistic risk perception measure.** To generalize beyond the Weinstein (1980) optimism items used in Studies 2 and 3, participants in Study 4 completed a revised measure. The measure combined nine of the original Weinstein items with six new items and presented a simplified response format.<sup>6</sup> A simplified response scale simply asked participants to indicate on 9-point scales the likelihood that the event would happen to them at any point in their life (−4 = *extremely unlikely*, 4 = *extremely likely*). As before, we reverse scored the negative items and then combined all items into one optimism factor using principal-components factor analysis.

**Appraisal measures.** Drawing on Smith and Ellsworth's (1985) analysis of certainty and control appraisals, we created three self-report items for each of the two appraisal dimensions (Appendix B contains the items). The control items assessed participants' views about the extent to which

<sup>6</sup> The 15 items for Study 4 included all 8 of the previously rated ambiguous items (see Appendix A) and the following new items, which we expected would vary with respect to ambiguity: "I did something in a job interview that made me embarrassed," "I enjoyed my postgraduation job," "I said something idiotic in front of my classmates," "I got lost at night for more than 15 minutes," "I was on an airplane that encountered severe turbulence," "I received favorable medical tests at age 60," and "I encountered a dangerous snake while on vacation."



the events they described were under individual versus situational control. The certainty items assessed the extent to which the events described were predictable and certain versus unpredictable and uncertain. For each item, participants responded on a scale ranging from 1 (*not at all*) to 6 (*very much*). We created a factor score for each of the two dimensions by imposing a one-factor principal-components solution (for each dimension) that retained all items. Unlike in Study 3, perceived certainty and perceived controllability were not significantly related ( $r = .12, p = .18$ , one-tailed). This finding is consistent with our view that the two dimensions can be empirically parsed or not, depending on the target events.

### Results and Discussion

We hypothesized that momentary emotions would influence global beliefs about control, certainty, and optimism. We tested this hypothesis by means of a one-way multivariate analysis of variance (MANCOVA) with emotion condition as the independent variable, appraisal factor scores and optimism as the dependent variables, and baseline affect (scores from the PANAS) as covariates.<sup>7</sup> The results indicated a significant multivariate effect of emotion on the dependent variables,  $F(3, 53) = 11.56, p < .01$  (Wilks's  $\lambda = .61, \eta^2 = .39$ ). It is important to note that all individual effects were significant and consistent with the hypotheses. Compared with fear, anger activated higher appraisals of certainty ( $M_s = 0.16$  vs.  $-0.40$ ),  $F(1, 59) = 4.33, p < .05$ , higher appraisals of individual control ( $M_s = 0.68$  vs.  $-0.51$ ),  $F(1, 59) = 28.37, p < .01$ , and higher optimism in risk estimates ( $M_s = 0.28$  vs.  $-0.25$ ),  $F(1, 59) = 4.91, p < .05$ . Figure 4 displays these patterns.<sup>8</sup> None of the baseline-affect measures proved to be significant covariates in the univariate tests; however, baseline positive affect had a marginal covariance effect on optimism,  $F(1, 59) = 3.79, p = .057$ .

Having confirmed that the main effects of fear and anger were consistent with the hypothesized pattern, we sought to test whether

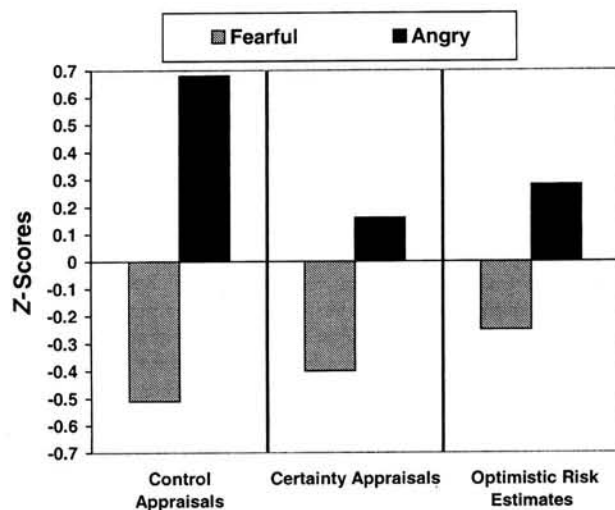


Figure 4. Fear and anger had opposite effects on cognitive appraisals and on optimistic risk estimates. For appraisals of control, higher values represent increasing individual control (as opposed to situational control). For appraisals of certainty, higher values represent increasing certainty. Reported means are standardized values adjusted for covariance with self-reported baseline affect.

the observed appraisal differences would mediate the effects of emotion on optimism. To test this final link, we conducted separate path analyses for control appraisals and for certainty appraisals. In each analysis, we regressed participants' optimism factor scores on the set of potential determinants of those scores, including emotion condition (1 = fear, 2 = anger) and appraisal-factor score. In both sets of path analyses, we controlled for the same baseline emotion variables as in the initial MANCOVA. Figure 5 displays the standardized beta coefficients for these relations. Consistent with the mediation hypothesis, induced emotion (fear vs. anger) strongly predicted appraisals of control,  $t(59) = 5.33, p < .01$ ; appraisals of control predicted optimism,  $t(59) = 2.13, p < .05$ ; and the once-significant direct path from induced emotion to optimism,  $t(59) = 2.22, p < .05$ , fell to insignificance when the appraisals-of-control factor was introduced in the same equation,  $t(59) = 1.20, p > .05$ .<sup>9</sup> A similar pattern occurred for the appraisals-of-certainty factor, but the full pattern of links required to demonstrate mediation failed to reach significance. Combining the two appraisal dimensions into one index was not warranted, given their insignificant relation ( $r = .12, p = .18$ , one-tailed). Future studies will need to examine why control mediated the relation in this case but certainty did not. We suspect that measurement problems may have played a role, given the modest reliability ( $\alpha$  for the certainty scale = .63).

In sum, the effects of fear on all three outcomes (risk perception, appraisals of certainty, and appraisals of control) contrasted the effects of anger on these same outcomes. Moreover, in the case of control appraisals, the appraisal differences mediated the emotion-perception effect.

### General Discussion

The present studies extend our understanding of affect and judgment in several ways. First, they document that fearful individuals consistently made relatively pessimistic judgments and choices, whereas both happy and angry individuals consistently made relatively optimistic judgments and choices. It is important to note that fear and anger differences were robust phenomena. They emerged regardless of whether (a) judgment targets were

<sup>7</sup> We used a multivariate test to reduce the likelihood of Type I errors and to account for relations among the dependent variables. Appraisals of control correlated with optimism at  $.23, p = .04$ , one tailed. No other correlations were significant. The baseline affect measures were not significant covariates in the multivariate test.

<sup>8</sup> To demonstrate that the effects emerge regardless of how strongly participants responded to the emotional recall manipulation, we chose not to include intensity of emotional response to the manipulation as a covariate. However, if we had controlled for intensity of response, the differences between fear and anger conditions would be even greater. For optimism, the adjusted fear  $M = -0.32$ , and the adjusted anger  $M = 0.35$ . For appraisals of control, the adjusted fear  $M = -0.52$ , and the adjusted anger  $M = 0.68$ . Finally, for appraisals of certainty, the adjusted fear  $M = -0.38$ , and the adjusted anger  $M = 0.14$ . (All means expressed as standard scores.)

<sup>9</sup> Baseline fear and anger (from the PANAS) were not significant covariates for any of these effects. However, baseline positive affect (from the PANAS) was a significant covariate of effects on optimism when both appraisals of control and emotion condition were entered into the same equation,  $t(59) = 2.04, p < .05$ .

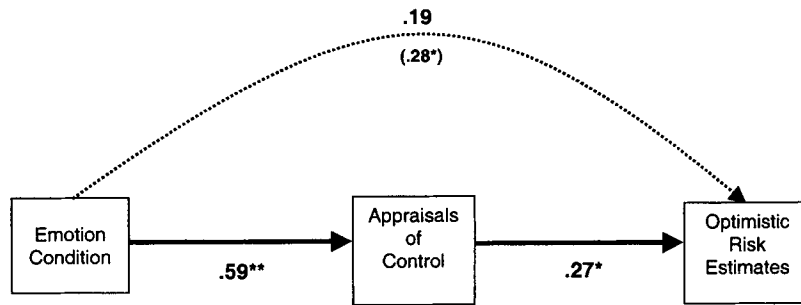


Figure 5. Appraisals of control mediated the effect of emotion condition on optimistic risk estimates. For the emotion condition, 1 = fear and 2 = anger. The dotted line indicates that the once-significant direct path from emotion condition to risk estimates ( $\beta = .28$ ) fell to nonsignificance ( $\beta = .19$ ) when the mediating variable—appraisals of control—was entered into the equation. The values are standardized beta coefficients. \* $p < .05$ . \*\* $p < .01$ .

relevant to the self or not, (b) probabilities were known or not, and (c) participants expressed their estimates publicly or anonymously. This consistent pattern of results suggests that an emotion-specific focus on traits and states sheds new light on the relations between emotions and judgments or choices involving risk. More generally, these studies contribute to a growing literature showing that dimensions of emotions other than valence may have as much (or more) impact as valence does (e.g., DeSteno et al., 2000; Keltner, Ellsworth, & Edwards, 1993; Tiedens & Linton, in press).

Second and more important, the present studies provide some of the first evidence regarding how specific emotions shape judgments and choices (see also Bodenhausen et al., 1994). Specifically, appraisal tendencies appear to mediate emotion and judgment outcomes. We used three strategies to assess the hypothesized mediators. In Studies 2 and 3 we strategically selected emotions that differed in terms of valence but resembled one another in terms of certainty and control. As predicted, happiness and anger were associated with optimism, suggesting that underlying appraisals of certainty and control accounted for the associations of these emotion dispositions with optimism. In Study 3 we documented an important boundary condition for the influences of emotion-related appraisal tendencies: Fear and anger only influenced judgments that were ambiguous in terms of certainty and control. Finally, in Study 4 we found that participants' own appraisals mediated the causal effects of fear and anger on optimism.

#### *Implications for the Study of Emotion and Personality*

##### *Implications for Personality Processes*

Several personality theorists have speculated that individual differences in specific emotions consistently shape how the individual perceives the social environment (e.g., Lyubomirsky & Ross, 1997; Lyubomirsky & Tucker, 1998; Magai & McFadden, 1995; Malatesta & Wilson, 1988). Our findings support this view and suggest that emotion-related appraisal tendencies may link stable traits (e.g., fearfulness or hostility) to the ways an individual interprets, acts on, and creates specific social interactions (Cantor & Zirkel, 1990; Keltner, 1996; Larsen, Diener, & Cropanzano, 1987; Magai & McFadden, 1995). For example, the present findings—that angry people systematically perceive less risk and make

risk-seeking choices—may explain why angry people experience heightened rates of divorce (Caspi, Elder, & Bem, 1987), occupational problems (Caspi et al., 1987), coronary health problems (Dembroski, MacDougall, Williams, & Haney, 1985), and, ultimately, early mortality (Barefoot, Dodge, Peterson, Dahlstrom, & Williams, 1989).<sup>10</sup> Although less is known about life outcomes of fearful individuals, research could explore the possibility that fearful people systematically favor risk-free options over potentially more rewarding but uncertain options.

#### *Implications for the Study of Judgment and Decision-Making*

Individual differences and emotion represent two important yet understudied areas in judgment and choice (for discussion, see Lopes, 1987; Mellers et al., 1997; Weber & Milliman, 1997). Adding empirical content to recent theoretical speculation (see Levin, 1999; Loewenstein & Lerner, in press; Loewenstein et al., 2001), the present studies document that a small number of trait emotion measures (fear and anger) can predict judgment and choice behavior across a range of judgment tasks and situations. Specifically, the same patterns for fear and for anger appeared across tasks assessing risk perception (Study 4), risk preferences (Study 1), and one's comparative chances of experiencing a variety of positive and negative events (Studies 2 and 3). Translating these tasks into behavioral decision theory terms usefully highlights the differences among them. Study 4 assessed simple probability judgments ( $p[x]$ ); Study 1 assessed risk preferences, which are presumably shaped by an underlying utility function ( $u[x]$ ; see Kahneman & Tversky, 1979; Tversky & Kahneman, 1981); and Studies 2 and 3 assessed compound probability judgments ( $p[x, \text{given me as an actor}]$  vs.  $p[x, \text{given the average student as an}$

<sup>10</sup> One could argue that anger assessed in our college student samples cannot speak to such distant life outcomes as divorce and coronary health. A recent study suggests otherwise. Siegler and colleagues (Siegler, Peterson, Barefoot, & Williams, 1992) found that hostility assessed among college students predicted major coronary risk factors assessed 21–23 years later (e.g., lipid levels, caffeine consumption, body mass index, and smoking).

actor)). According to traditional theories of rational choice, probability and utility should be orthogonal (for discussion, see Weber, 1994), not linked by a third variable—let alone linked by a variable that captures individual differences in emotion. Our findings suggest otherwise, and they are consistent with more recent descriptive models that allow for interdependencies between probability judgments ( $p[x]$ ) and utility estimates ( $u[x]$ ; see Lopes & Oden, 1999; Tversky & Kahneman, 1992; Weber, 1994). Thus, linking emotion and personality processes to judgment and decision processes yields more than an additive effect. Beyond providing new insights for each of the respective literatures, the product of these literatures raises provocative questions about traditional models of rational choice.

### *Future Directions and Boundary Conditions*

#### *Future Directions*

The present studies explore only one part of an appraisal-tendency approach to affect and judgment or choice (for a fuller array of predictions, see Lerner & Keltner, 2000). There are other appraisal tendencies (e.g., anticipated effort, attentional activity) and corresponding goals that are sure to sway important judgments and choices, and these effects of emotion warrant study. For example, building on Forgas' (1998) finding that valenced moods moderate the "correspondence bias" (i.e., underestimating situational factors and overestimating dispositional factors when attributing causality; see Gilbert & Malone, 1995; Ross, 1977), we would expect sadness and anger to trigger variation in the correspondence bias. The rationale is that anger elicits causal attributions to individuals, whereas sadness elicits causal attributions to situations (Keltner, Ellsworth, & Edwards, 1993).

We also hasten to note that recent advances in the study of affect and judgment raise several questions that we did not address in the present investigation. First, the present studies were not designed to disentangle whether fear and anger exerted a direct influence on judgments and choices, as the mood-as-information model implies (see Schwarz, 1990), or an indirect influence, as network models imply (see Bower, 1991). Following Forgas' (1995) affect infusion model, a fruitful next step is to determine whether the influence of emotions on judgments is direct (wherein decision makers use their affect to infer evaluative reactions to a choice) or indirect (wherein decision makers selectively attend to, encode, and retrieve affect-congruent information when making a choice). In a similar vein, it will be important to explore relations between the current work, which documents the effects of emotion on the content of judgments and choices, with work addressing emotion effects on the process of judgments and choices (e.g., heuristic vs. systematic modes; see Bodenhausen et al., 1994; Forgas, 1998; Tiedens & Linton, in press). Finally, it is important to connect the appraisal-tendency hypothesis to work on motivational influences of affect, such as Isen, Nygren, and Ashby's (1988) intriguing finding that people in good moods are less inclined to risk meaningful losses than are controls—presumably because they care more about protecting their positive states than do neutral-affect individuals.

#### *Boundary Conditions*

An appraisal-tendency approach also generates hypotheses concerning boundary conditions for the influences of emotion on judgment and choice. As Study 3 revealed, the extent to which a judgment target manifests a primed appraisal dimension determines the degree of influence the corresponding emotion has on judgment. If an event is clearly high (or clearly low) on the primed dimension associated with the emotion, then emotional carryover will be relatively weak. If an event is ambiguous with respect to the dimension, then influence will be strong.

We also expect that situational factors can moderate the influence of an emotional appraisal tendency. For example, solving (or knowing that another has solved) an emotion-eliciting problem deactivates an appraisal tendency, even if the emotion persists experientially (for evidence consistent with this hypothesis, see Goldberg et al., 1999). In addition, becoming aware of one's own judgment and choice process should deactivate appraisal tendencies, even if the emotion itself persists (see Lerner et al., 1998).

These patterns may also vary by culture. Because people from collectivist cultures are less likely to use feelings when making judgments of life satisfaction than are people from individualistic cultures (Suh, Diener, Oishi, & Triandis, 1998), fear and anger may exert less pronounced influences on assessments of risk and optimism in collectivist cultures (Suh et al., 1998). In addition, happiness and anger may share more conceptual affinities in the United States than they do in cultures where confrontation is considered dangerous and disengagement is favored (A. Johnson, Johnson, & Baksh, 1986).<sup>11</sup> Cross-national comparisons will need to test the generalizability of our results and, more generally, to address the extent to which appraisal tendencies are universal properties of emotion.

#### *Conclusion*

Different appraisals of certainty and control define fear and anger. As a result of these differences, fear and anger activate sharply contrasting perceptions of risk. Because perceptions of risk underlie countless decisions in daily life—ranging from relationships to finance to health—these contrasting perceptions may have manifold effects. Drawing on an appraisal-tendency approach, we can systematically study these (and other emotion) effects with increasing precision.

<sup>11</sup> Whereas respondents from the United States conceive of anger as a relatively good and empowering emotion when compared with fear, respondents from the peaceful Machiguenga Indians in the Peruvian Amazon consider fear as a relatively good emotion when compared with anger. Indeed, the Machiguenga seek to avoid anger at all costs (A. Johnson et al., 1986).

#### *References*

- Barefoot, J. C., Dodge, K. A., Peterson, B. L., Dahlstrom, W. G., & Williams, R. B. (1989). The Cook-Medley Hostility scale: Item content and ability to predict survival. *Psychosomatic Medicine*, 51, 46–57.
- Bernstein, D. A., & Allen, G. J. (1969). Fear survey schedule (II): Nor-

- mative data and factor analysis based upon a large college sample. *Behavior Research and Therapy*, 7, 403–408.
- Bodenhausen, G., Sheppard, L., & Kramer, G. (1994). Negative affect and social judgment: The different impact of anger and sadness. *European Journal of Social Psychology*, 24, 45–62.
- Bower, G. H. (1991). Mood congruity of social judgment. In J. Forgas (Ed.), *Emotion and social judgment* (pp. 31–54). Oxford, England: Pergamon Press.
- Cantor, N., & Zirkel, S. (1990). Personality, cognition, and purposive behavior. In L. Pervin (Ed.), *Handbook of personality: Theory and research* (pp. 135–164). New York: Guilford.
- Caspi, A., Elder, G. H., & Bem, D. J. (1987). Moving against the world: Life-course patterns of explosive children. *Developmental Psychology*, 23, 308–313.
- Darley, J. M., & Gross, P. H. (1983). A hypothesis-confirming bias in labeling effects. *Journal of Personality and Social Psychology*, 44, 20–33.
- Dawes, R. (1998). Behavioral decision making and judgment. In D. T. Gilbert, S. T. Fiske, & G. Lindzey (Eds.), *The handbook of social psychology* (Vol. 1, pp. 497–548). New York: Oxford University Press.
- Dembroski, T. M., MacDougall, J. M., Williams, R. B., & Haney, T. L. (1985). Components of Type A, hostility, anger-in: Relationship to angiographic findings. *Psychosomatic Medicine*, 47, 219–233.
- DeSteno, D., Petty, R. E., Wegener, D. T., & Rucker, D. D. (2000). Beyond valence in the perception of likelihood: The role of emotion specificity. *Journal of Personality and Social Psychology*, 78, 397–416.
- Elster, J. (1998). Emotions and economic theory. *Journal of Economic Literature*, 36, 47–74.
- Forgas, J. P. (1995). Mood and judgment: The affect infusion model (AIM). *Psychological Bulletin*, 117, 39–66.
- Forgas, J. P. (1998). On being happy and mistaken: Mood effects on the fundamental attribution error. *Journal of Personality and Social Psychology*, 75, 318–331.
- Frijda, N. H. (1986). *The emotions*. Cambridge, England: Cambridge University Press.
- Gasper, K., & Clore, G. L. (1998). The persistent use of negative affect by anxious individuals to estimate risk. *Journal of Personality and Social Psychology*, 74, 1350–1363.
- Geer, J. H. (1965). The development of a scale to measure fear. *Behavior Research and Therapy*, 3, 45–53.
- Gilbert, D. T., & Malone, P. S. (1995). The correspondence bias. *Psychological Bulletin*, 117, 21–38.
- Goldberg, J. H., Lerner, J. S., & Tetlock, P. E. (1999). Rage and reason: The psychology of the intuitive prosecutor. *European Journal of Social Psychology*, 29, 781–795.
- Gross, J. J., & Levenson, R. W. (1995). Emotion elicitation using films. *Cognition and Emotion*, 9, 87–108.
- Gross, J. J., Sutton, S. K., & Ketelaar, T. (1998). Relations between affect and personality: Support for the affect-level and affective-reactivity views. *Personality and Social Psychology Bulletin*, 24, 279–288.
- Isen, A. M., Nygren, T. E., & Ashby, F. G. (1988). Influence of positive affect on the subjective utility of gains and losses: It is just not worth the risk. *Journal of Personality and Social Psychology*, 55, 710–717.
- Isen, A. M., Shalker, T. E., Clark, M., & Karp, L. (1978). Affect, accessibility of material in memory, and behavior: A cognitive loop? *Journal of Personality and Social Psychology*, 36, 1–12.
- Johnson, A., Johnson, O., & Baksh, M. (1986). The colors of emotions in Machiguenga. *American Anthropologist*, 88, 674–681.
- Johnson, E. J., & Tversky, A. (1983). Affect, generalization, and the perception of risk. *Journal of Personality and Social Psychology*, 45, 20–31.
- Judd, C. M., & McClelland, G. H. (1989). *Data analysis: A model comparison approach*. San Diego, CA: Harcourt Brace Jovanovich.
- Kahneman, D., & Tversky, A. (1979). Prospect theory. *Econometrica*, 47, 263–292.
- Kavanagh, D. J., & Bower, G. H. (1985). Mood and self-efficacy: Impact of joy and sadness on perceived capabilities. *Cognitive Therapy and Research*, 9, 507–525.
- Keltner, D. (1996). Facial expressions of emotion and personality. In C. Malatesta-Magai & S. H. McFadden (Eds.), *Handbook of emotion, adult development, and aging* (pp. 385–401). New York: Academic Press.
- Keltner, D., Ellsworth, P. C., & Edwards, K. (1993). Beyond simple pessimism: Effects of sadness and anger on social perception. *Journal of Personality and Social Psychology*, 64, 740–752.
- Keltner, D., Locke, K. D., & Audrain, P. C. (1993). The influence of attributions on the relevance of negative feelings to personal satisfaction. *Personality and Social Psychology Bulletin*, 19, 21–29.
- Larsen, R. J., Diener, E., & Cropanzano, R. S. (1987). Cognitive operations associated with individual differences in affect intensity. *Journal of Personality and Social Psychology*, 53, 767–774.
- Larsen, R. J., & Ketelaar, T. (1989). Extraversion, neuroticism and susceptibility to positive and negative mood induction procedures. *Personality and Individual Differences*, 10, 1221–1228.
- Lazarus, R. S. (1991). *Emotion and adaptation*. New York: Oxford University Press.
- Lazarus, R. (1994). The stable and the unstable in emotion. In P. Ekman & R. Davidson (Eds.), *The nature of emotion: Fundamental questions* (pp. 79–85). New York: Oxford University Press.
- Lerner, J. S., Goldberg, J. H., & Tetlock, P. E. (1998). Sober second thought: The effects of accountability, anger and authoritarianism on attributions of responsibility. *Personality and Social Psychology Bulletin*, 24, 563–574.
- Lerner, J. S., & Keltner, D. (2000). Beyond valence: Toward a model of emotion-specific influences on judgment and choice. *Cognition and Emotion*, 14, 473–493.
- Levin, I. P. (1999, November). *Why do you and I make different decisions? Tracking individual differences in decision making*. Presidential address to the Society for Judgment and Decision Making, Los Angeles.
- Loewenstein, G., & Lerner, J. S. (in press). The role of affect in decision making. In R. Davidson, K. Scherer, & H. Goldsmith (Eds.), *Handbook of affective science*. New York: Oxford University Press.
- Loewenstein, G. F., Weber, E. U., Hsee, C. K., & Welch, E. (2001). Risk as feelings. *Psychological Bulletin*, 127, 267–286.
- Lopes, L. L. (1987). Between hope and fear: The psychology of risk. In B. Leonard (Ed.), *Advances in experimental social psychology* (Vol. 20, pp. 255–295). San Diego, CA: Academic Press.
- Lopes, L. L., & Oden, G. C. (1999). The role of aspiration level in risky choice: A comparison of cumulative prospect theory and SP/A theory. *Journal of Mathematical Psychology*, 43, 286–313.
- Lyubomirsky, S., & Ross, L. (1997). Hedonic consequences of social comparison: A contrast of happy and unhappy people. *Journal of Personality and Social Psychology*, 73, 1141–1157.
- Lyubomirsky, S., & Tucker, K. L. (1998). Implications of individual differences in subjective happiness for perceiving, interpreting, and thinking about life events. *Motivation and Emotion*, 22, 155–186.
- Magai, C., & McFadden, S. H. (1995). *The role of emotions in social and personality development: History, theory, and research*. New York: Plenum Press.
- Malatesta, C. Z., & Wilson, A. (1988). Emotion cognition interaction in personality development: A discrete emotions, functionalist analysis. *British Journal of Social Psychology*, 27, 91–112.
- Mayer, J. D., Gaschke, Y. N., Braverman, D. L., & Evans, T. W. (1992). Mood-congruent judgment is a general effect. *Journal of Personality and Social Psychology*, 63, 119–132.
- Mayer, J. D., & Hanson, E. (1995). Mood-congruent judgment over time. *Personality and Social Psychology Bulletin*, 21, 237–244.

- McDaniels, T. L., Axelrod, L. J., Cavanagh, N. S., & Slovic, P. (1997). Perception of ecological risk to water environments. *Risk Analysis*, 17, 341-352.
- Mellers, B. A., Schwartz, A., Ho, K., & Ritov, I. (1997). Decision affect theory: Emotional reactions to the outcomes of risky options. *Psychological Science*, 8, 423-429.
- Mellers, B. A., Schwartz, A., & Weber, E. U. (1997). Do risk attitudes reflect in the eye of the beholder? In A. A. J. Marley (Ed.), *Choice, decision, and measurement: Essays in honor of R. Duncan Luce* (pp. 57-71). Mahwah, NJ: Erlbaum.
- Ohman, A. (1993). Fear and anxiety as emotional phenomena: Clinical phenomenology, evolutionary perspectives, and information-processing mechanisms. In M. Lewis & J. M. Haviland (Eds.), *Handbook of emotions* (pp. 511-536). New York: Guilford.
- Ortony, A., Clore, G. L., & Collins, A. (1988). *The cognitive structure of emotions*. New York: Cambridge University Press.
- Raghunathan, R., & Pham, M. T. (1999). All negative moods are not equal: Motivational influences of anxiety and sadness on decision making. *Organizational Behavior and Human Decision Processes*, 79, 56-77.
- Roseman, I. J. (1984). Cognitive determinants of emotion: A structural theory. *Review of Personality and Social Psychology*, 5, 11-36.
- Ross, L. (1977). The intuitive psychologist and his shortcomings: Distortions in the attribution process. *Advances in Experimental Social Psychology*, 10, 174-221.
- Scherer, K. R. (1982). Emotion as a process: Function, origin and regulation. *Social Science Information*, 21, 555-570.
- Scherer, K. R. (1999). Appraisal theory. In T. Dalgleish & M. J. Power (Eds.), *Handbook of cognition and emotion* (pp. 637-663). Chichester, England: Wiley.
- Schwarz, N. (1990). Feelings as information: Informational and motivational functions of affective states. In E. T. Higgins & R. M. Sorrentino (Eds.), *Handbook of motivation and cognition: Foundations of social behavior* (Vol. 2, pp. 527-561). New York: Guilford.
- Schwarz, N., & Clore, G. L. (1983). Mood, misattribution and judgments of well-being: Informative and directive functions of affective states. *Journal of Personality and Social Psychology*, 45, 513-523.
- Siegler, I., Peterson, B., Barefoot, J., & Williams, R. (1992). Hostility during late adolescence predicts coronary risk factors at mid-life. *American Journal of Epidemiology*, 136, 146-154.
- Slovic, P. (1987). Perception of risk. *Science*, 236, 280-285.
- Smith, C. A., & Ellsworth, P. C. (1985). Patterns of cognitive appraisal in emotion. *Journal of Personality and Social Psychology*, 48, 813-838.
- Spielberger, C. D. (1983). *State-Trait Anxiety Inventory for Adults*. Palo Alto, CA: Mind Garden.
- Spielberger, C. D. (1996). *Manual for the State-Trait Anger Expression Inventory (STAXI)*. Odessa, FL: Psychological Assessment Resources.
- Suh, E., Diener, E., Oishi, S., & Triandis, H. C. (1998). The shifting basis of life satisfaction judgments across cultures: Emotions versus norms. *Journal of Personality and Social Psychology*, 74, 482-493.
- Suls, J., & Wan, C. K. (1987). In search of the false-uniqueness phenomenon: Fear and estimates of social consensus. *Journal of Personality and Social Psychology*, 52, 211-217.
- Taylor, S. E. (1991). Asymmetrical effects of positive and negative events: The mobilization-minimization hypothesis. *Psychological Bulletin*, 110, 67-85.
- Tiedens, L. Z., & Linton, S. (in press). Judgment under emotional uncertainty: The effects of specific emotions on information processing. *Journal of Personality and Social Psychology*.
- Tversky, A., & Kahneman, D. (1981). The framing of decisions and the psychology of choice. *Science*, 211, 453-458.
- Tversky, A., & Kahneman, D. (1984). Choices, values, frames. *American Psychologist*, 39, 341-350.
- Tversky, A., & Kahneman, D. (1992). Advances in prospect theory: Cumulative representation of uncertainty. *Journal of Risk and Uncertainty*, 5, 297-323.
- Uleman, J. S., & Bargh, J. A. (Eds.). (1989). *Unintended thought*. New York: Guilford.
- Underwood, B., & Froming, W. J. (1980). The Mood Survey: A personality measure of happy and sad moods. *Journal of Personality Assessment*, 44, 404-414.
- Watson, D., Clark, L. A., & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: The PANAS scales. *Journal of Personality and Social Psychology*, 54, 1063-1070.
- Weber, E. U. (1994). From subjective probabilities to decision weights—the effect of asymmetric loss functions on the evaluation of uncertain outcomes and events. *Psychological Bulletin*, 115, 228-242.
- Weber, E. U. (1997). The utility of measuring and modeling perceived risk. In A. A. J. Marley (Ed.), *Choice, decision, and measurement: Essays in honor of R. Duncan Luce* (pp. 45-56). Mahwah, NJ: Erlbaum.
- Weber, E. U., & Milliman, R. A. (1997). Perceived-risk attitudes: Relating risk perception to risky choice. *Management Science*, 43, 123-144.
- Weiner, B. (1986). Attribution, emotion, and action. In R. M. Sorrentino & E. T. Higgins (Eds.), *Handbook of motivation and cognition: Foundations of social behavior* (pp. 281-312). New York: Guilford.
- Weiner, B., Graham, S., & Chandler, C. (1982). Pity, anger, and guilt: An attributional analysis. *Personality and Social Psychology Bulletin*, 8, 226-232.
- Weinstein, N. D. (1980). Unrealistic optimism about future life events. *Journal of Personality and Social Psychology*, 39, 806-820.
- Wright, W. F., & Bower, G. H. (1992). Mood effects on subjective probability assessment. *Organizational Behavior and Human Decision Processes*, 52, 276-291.

## Appendix A

## Target Events From Study 3

Life events perceived as ambiguous with respect to certainty and control:

- I had a heart attack before age 50.
- My achievements were written up in a newspaper.
- I could not find a job for 6 months.
- I received statewide recognition in my profession.
- I developed gum problems.
- My income doubled within 10 years after my first job.
- I married someone wealthy.
- I chose the wrong profession.

Life events perceived as unambiguous with respect to certainty and control (i.e., the events are clearly controllable and certain or clearly uncontrollable and uncertain):

- My car was stolen. (a)
- I was injured in an auto accident. (a)
- I developed cancer. (a)
- I had an intellectually gifted child. (a)

- I tripped and broke a bone. (a)
- My home doubled in value in 5 years. (a)
- I was sued by someone. (a)
- I was not ill all winter. (a)
- I divorced less than 7 years after I got married. (a)
- I developed a drinking problem. (b)
- I enjoyed my postgraduation job. (b)
- My work received an award. (b)
- I contracted a sexually transmitted disease. (b)
- I had a decayed tooth extracted. (b)
- My weight remained constant for 10 years. (b)
- I graduated in the top third of my class. (b)
- I traveled to Europe. (b)

*Note.* Letters in parentheses denote type of event: (a) events perceived as uncontrollable and uncertain, (b) events perceived as controllable and certain.

## Appendix B

## Appraisal Items From Study 4

Items measuring control appraisals (high scores indicated individual control, low scores indicated situational control)

1. In the events that you described on the previous pages, to what extent did you typically feel that someone other than yourself had the ability to influence what was happening?
2. In the events that you described on the previous pages, to what extent did you typically feel that someone else was to blame for what was happening in the situation?
3. In the events that you described on the previous pages, to what extent were the events beyond anyone's control? (reverse-scored item)

Items measuring certainty appraisals (high scores indicated certainty, low scores indicated uncertainty)

1. In the events that you described on the previous pages, how well did you understand what was happening in the situation?
2. In the events that you described on the previous pages, how uncertain were you about what would happen in various situations? (reverse-scored item)
3. In the events that you described on the previous pages, how well could you typically predict what was going to happen next?

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