

Emotion

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Jolie Baumann and David DeSteno

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Context Explains Divergent Effects of Anger on Risk Taking

Jolie Baumann and David DeSteno
Northeastern University

The emotion anger is typically associated with increased risk taking. However, anger also produces increased probability estimates that emotionally congruent negative events will occur. This latter finding suggests that the general assumption that anger always increases risky decision making may be subject to caveat. The context of a risk-taking opportunity may dictate whether anger leads to greater or lesser acceptance of risk as a function of which component of the emotional state (i.e., affective or conceptual) is salient. In the experiment reported, participants completed one of two versions of a risk-taking measure that differ according to whether they evoke decisions based on affective feelings or more deliberate reasoning. Results demonstrated that angry participants made riskier decisions than their neutral counterparts under conditions less susceptible to the use of affective information, but made less risky decisions under conditions that favored the use of affective information. The importance of studying emotional states as multifaceted and contextualized phenomenon is discussed.

Keywords: emotion, decision making, risk taking

A consensus has emerged that anger leads to increases in risky decision making (Lerner & Tiedens, 2006; Keltner & Lerner, 2010). However, careful review of the literature suggests the possibility of a lurking paradoxical effect that might necessitate qualification of this general view. Although many studies have demonstrated that anger can lead to more optimistic risk estimates, and thereby greater tendencies to accept risks (Lerner & Keltner, 2001; Loewenstein & Lerner, 2003), other experiments have demonstrated that anger can increase estimates for the occurrence of conflict- or frustration-related events (Baumann & DeSteno, 2010; DeSteno, Petty, Wegener, & Rucker, 2000; DeSteno, Petty, Rucker, Wegener, & Braverman, 2004). Inflation of estimates for such events should, it seems, lead individuals at times to engage in less risky behavior, as most people would certainly prefer to avoid outcomes characterized by frustration or aggression. Thus, it seems likely that features of the risk-taking task or opportunity may bring different aspects of the experience of anger to bear on the decision to engage in risky behavior.

According to constructionist views of emotions, such as the Conceptual Act Model, emotions exist as emergent states comprising both affective and conceptual components (Barrett, 2012; Barrett, 2009; Lindquist & Barrett, 2008). That is, the experience of a discrete emotional state includes an experience of core affective valence and arousal (i.e., sensations of pleasure/displeasure and activation/deactivation arising from the body) as well as

activation of conceptual knowledge concerning the specific emotion in question (i.e., learned associations with emotion labels and associated appraisals). Of import, emerging evidence suggests that these components may be independent of one another and associated with their own predictive validity in terms of an emotional state's influence on decision making or behavior (Lindquist & Barrett, 2008; Wilson-Mendenhall, Barrett, Simmons, & Barsalou, 2011). Accordingly, the effect a given emotion will ultimately have on a behavior like risk taking may depend on which of its component(s) are contributing to the decision-making process. That is, when deciding whether or not to accept a given risk, individuals experiencing a specific emotion may rely primarily on the affective component of their emotional experience in some instances but may rely primarily on the conceptual component of their experience in others.

Anger is particularly well suited to examine this claim as, unlike most other negative emotions (e.g., sadness), the affective and conceptual components of anger lead to divergent predictions with respect to risk taking. For instance, research on the cognitive dimensions underlying specific emotions has repeatedly demonstrated that anger is associated with heightened appraisals of controllability and certainty (Ellsworth & Scherer, 2003), which in turn result in more optimistic risk estimates (Lerner & Keltner, 2001; Loewenstein & Lerner, 2003). Thus, if one is relying more heavily on the conceptual knowledge or related cognitive components of anger when deciding whether or not to accept a risk, the experience of anger should increase risk taking.

Consideration of the affective component of anger, however, leads one to predict an opposing effect. For instance, anger is typically experienced as a negatively valenced affective state, and researchers have demonstrated that such feelings are often used to adjust expectations for the ambiguous likelihoods of subsequent events (Clore et al., 2001). That is, past research has demonstrated that positive emotions increase likelihood estimates for future positive events while negative emotions increase likelihood estimates for future negative events (Johnson & Tversky, 1983). With

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Jolie Baumann and David DeSteno, Department of Psychology, Northeastern University.

Correspondence concerning this article should be addressed to Jolie Baumann or David DeSteno, Department of Psychology, Northeastern University, 360 Huntington Avenue, 125 NI, Boston, MA 02115. E-mail: joliebaumann@gmail.com or d.desteno@gmail.com

respect to anger in particular, previous work has shown that it specifically increases expectancies that frustrating, irritating, or conflict-based events will soon occur (DeSteno et al., 2000; DeSteno, Petty, Rucker, Wegener, & Braverman, 2004; Baumann & DeSteno, 2010). Thus, if one is relying on affective or phenomenological feelings as a source of information to calculate an unknown risk, increases in expectancies for negative events should, in theory, reduce associated risk taking.

This reasoning suggests that the notion that anger always causes increased risk taking may be subject to an important qualification. Whether angry individuals make riskier choices may depend on which component of the emotion *anger* they are using in their decision-making—a factor that the risk-taking opportunity itself may often determine by its very context.

To examine the proposed contextual sensitivity of anger's influence on risk-taking, we designed an experiment in which neutral and angry participants completed one of two versions of the *Columbia Card Task* (CCT) risk-taking measure (Figner, Mackinlay, Wilkening, & Weber, 2009). The CCT is well-suited for our purposes as it possesses two forms: one designed to be more subject to the use of affective feelings (i.e., the *hot* version) than the other (the *cold* version). In both versions, the goal is to decide how many cards to draw from a deck comprising gain and loss cards. We suspected that anger would result in an increase in risk taking in the Cold CCT as a result of its enhancement of appraisals of control and certainty. Conversely, we suspected that anger would decrease risk taking in the Hot CCT as a result of the use of experienced affect as an informational cue for the likelihood of encountering losses. As such, we could readily examine whether the general effect of anger on risk taking is context sensitive.

Method

Participants

Ninety-nine participants drawn from the Northeastern University participant pool were randomly assigned to one of four experimental conditions. These conditions constituted a crossing between induced emotion (Neutral vs. Anger) and CCT version (Cold vs. Hot).

Procedure

Participants first completed an autobiographical memory task meant to induce either a neutral or an angry emotional state. More specifically, they were asked to remember and write in detail for four minutes about a past experience that had made them feel angry or about their typical day.

Participants then completed a shortened version (six game trials) of either the Hot or Cold CCT.¹ In both versions of the CCT participants were shown a deck of 32 cards face down on a computer screen. For each trial, participants were told the number of loss cards in the deck (one or three), the number of negative points that each loss card was worth (250 or 750), and the number of positive points that each gain card was worth (25). Participants then decided how many cards to turn over in each trial. Importantly, if a loss card were ever drawn, the given number of points was subtracted from the participant's current score and the trial ended. That is, for any given trial participants could not continue

to turn over cards after turning over a loss card. Thus, the goal was to earn points by turning over cards with positive point values (gain cards) while avoiding cards with negative point values (loss cards). The primary measure of risk taking was the average number of gain cards turned over on trials where a loss card was not encountered.²

Consistent with Figner et al. (2009), the game itself was rigged. On four of the trials the loss cards were always the last cards to be selected regardless of which particular cards a participant chose on the screen. To reduce possible suspicion of the game's fixed nature, the remaining two trials were rigged such that participants encountered a loss card early in the trial. These two trials were discarded before all analyses.

In the Hot CCT, participants chose cards to turn over one at a time and received immediate feedback about the card's point value with each decision to flip a card. Consequently, each trial in the Hot CCT ended when the participant clicked a button labeled "Stop" at the bottom of the computer screen or when a loss card was turned over. In the Cold CCT, participants made one decision for how many cards to turn over in each trial by selecting a number from 0–32 at the outset. They did not receive any feedback about their choices until the end of the task; the computer flipped cards during each trial without revealing any of them to the participant or allowing any changes in decisions.

These differences in the structure of the game have been shown to be differentially reliant on the use of feelings as information. For instance, Figner et al. (2009) demonstrated that participants who completed the Hot CCT were more likely to report using affective strategies (e.g., "I solved the task on a gut level"), whereas participants who completed the Cold CCT were more likely to report using cognitive strategies (e.g., "I tried to solve the task mathematically"). Moreover, measures of executive function predicted both information use and performance in the Cold but not the Hot CCT. Finally, measures of emotional arousal (both self-report and physiological measures) predicted performance in the Hot but not the Cold CCT. Accordingly, these two versions evidence good validity with respect to drawing differentially upon affective and cognitive resources.

At the end of the experiment, all participants completed a measure to assess their emotional states during the task; individual items spanned the positive and negative affective lexicon. Participants indicated the degree to which each of several emotion words described their feeling state using five-point scales. Anger was measured as the mean response to three items (Cronbach's alpha = .70): angry, annoyed, frustrated.

Results

Emotion Manipulation Checks

A 2 (Emotion) \times 2 (CCT Version) ANOVA revealed a significant main effect of emotion condition on participants' reported

¹ A pre-test revealed that performance on the shortened version of the CCT correlated highly with performance on the full version, $r = .82, p < .05$.

² Because the chances of encountering a loss card increased each time a gain card was turned over, the greater the number of cards turned over in a trial the greater risk a participant was taking.

experience of anger, $F(1, 95) = 21.19, p < .001$. As expected, participants who recalled an angering event reported experiencing heightened anger ($M = 2.51, SD = 0.85$) in comparison to participants who recalled their typical day ($M = 1.80, SD = 0.64$). Also as expected, the analysis failed to reveal any effect of CCT version on reported anger ($F_s < 1$), suggesting that the completion of the different tasks themselves did not significantly alter induced emotional states.³

Risk Taking

A 2 (Emotion) \times 2 (CCT Version) ANOVA confirmed the predicted moderation of the effect of anger on risk taking by context, $F(1, 95) = 8.22, p < .01, \omega^2 = .07$. As depicted in Figure 1, angry participants playing the cold version made riskier decisions than did their neutral counterparts, $t(43) = 1.98, p = .05$. However, angry participants playing the hot version evidenced risk aversion; they made less risky decisions than did neutral participants, $t(52) = 2.11, p < .05$. A main effect for version also emerged as subjects took greater risks overall in the Hot CCT than in the Cold CCT, $F(1, 95) = 81.49, p < .01$.⁴

As we view the emergent state of anger to consist of both affective and cognitive components (cf. Barrett, 2012; Lindquist & Barrett, 2008), and are claiming that the affective component (i.e., negative valence) is influencing performance on the Hot CCT while only contributing minimally to performance on the Cold CCT, it is useful to explore the relationship between self-reported affect and risk-taking behavior in these two versions of the task. We therefore calculated self-reported negative affect from the measure used to assess participants' emotional states. Negative affect was calculated as the mean response to all emotion items: gloomy, angry, sad, frustrated, fearful, annoyed, distressed, disgusted, queasy, sick, embarrassed, content (reverse-scored), pleasant (reverse-scored), and good (reverse-scored), (Cronbach's alpha = .76).⁵ In line with our predictions, analyses revealed a significant correlation between self-reported affective valence and risk taking (i.e., the average number of cards turned over) for participants who completed the Hot CCT ($r = -.27, p < .05$) such

that participants who reported experiencing more negative affect took fewer risks. Also in line with expectations, the same correlation failed to reach significance among participants who completed the Cold CCT ($r = -.13, ns$).

Discussion

These findings are among the first to show that the assumption that anger always leads to increased risk taking may be in need of qualification. In so doing, they not only identify an important stipulation to the commonly held view but also integrate seemingly paradoxical findings regarding anger's links to perceptions of future risk by demonstrating the ability of context to produce oppositional outcomes.

In the Cold CCT, where participants rely less on affective processes, we believe that activation of cognitive components related to anger (e.g., conceptual knowledge and associated appraisals) drives performance. This view is consistent with previous work by Lindquist and Barrett (2008) that demonstrated how priming different conceptual knowledge related to specific emotions (e.g., anger or fear) produced differential risk-taking decisions among participants experiencing the same heightened negative affective state. In the Hot CCT, where participants rely more on affective processes, we believe that participants experiencing anger take fewer risks because their negatively valenced state signals that negative outcomes are more likely. This view is consistent with previous findings demonstrating that heightened anger causes people to perceive greater likelihoods for the occurrence of angering events when using their emotional states as informative cues (DeSteno et al., 2000). Still, future studies should assess more directly the different processes involved in decision making in the two versions of the CCT by including measures and manipulations of the activation of conceptual knowledge associated with a given emotional state as well as more extensive measures of affective processing (e.g., physiological recordings).

These initial findings also suggest that future research might profitably explore other distinct features of risk-taking tasks that promote the use of either affective or deliberative processing at the expense of the other. We do not mean to propose that decisions are always solely the function of either purely "cold" rational or purely "hot" emotional processes; to the contrary, the current demonstration of the influence of emotion on both a "cold" and a "hot" task would argue against this rationale. Rather, decision making is likely influenced concurrently by both processes along some continuum ranging from more affective to more cognitive in nature, and contextual effects can momentarily favor the use of one kind

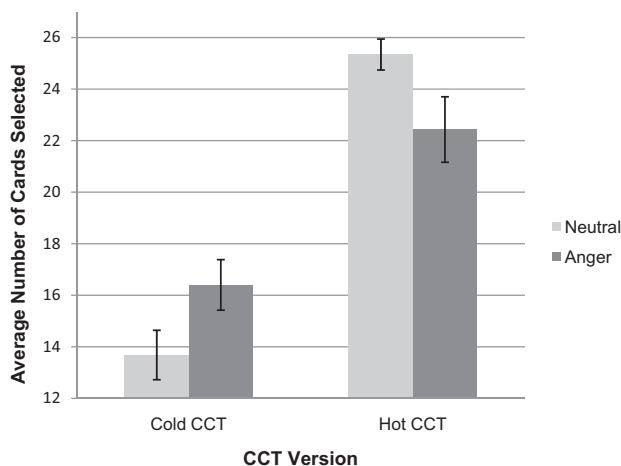


Figure 1. Risk taking as a function of emotion condition and CCT version. Error bars represent ± 1 standard error.

³ These findings suggest that emotional arousal alone is unlikely to account for any of the risk-taking findings. That is, there is no evidence to suggest that arousal from the emotion manipulation interacted with potential arousal differences caused by the CCT versions. Analysis of the self-report item assessing boredom also supports this claim. Although participants reported being significantly less bored during the Hot CCT ($M = 2.52, SD = 1.08$) than the Cold CCT ($M = 3.02, SD = 1.06$), $F(1,95) = 5.31, p < .05$, the emotion manipulation failed to affect self-reported boredom or interact with the effect of CCT version on boredom ($F_s < 1$).

⁴ The average numbers of cards turned over in the two versions of the CCT are consistent with findings from Figner et al.'s (2009) original studies.

⁵ Intensity of reported negative affect did not differ among angry participants completing the Hot and Cold versions of the CCT.

of information over the other by weighting the simultaneous impact of the different processes. Studying the characteristics of varying risk-taking opportunities more directly will ultimately enable increased confidence in predictions regarding how an emotion will impact any isolated case of risky decision making.

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