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Self-Distancing Regulates the Effect of Incidental Anger (vs. Fear) on Affective Decision-Making Under Uncertainty

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ABSTRACT

Emotions integral to a task are often adaptive, particularly in situations where outcomes and probabilities are not known. However, decisions are also influenced by emotions that arise from situations unrelated to the task. This is especially the case with negative emotions like fear and anger, which also tend to be accompanied by ruminative thinking that might divert decision-makers' attention from the task at hand. In two preregistered experiments, we show how self-distancing regulates the influence of incidental anger (vs. fear) on decision-making under uncertainty. Participants recalled and reflected on a fear-related or anger-related event from either a self-immersed or self-distanced perspective. Next, they completed a task that is commonly used to measure affective decision-making under uncertainty, the Iowa Gambling Task. The results in both experiments indicated that self-immersed angry (vs. fearful) decision-makers were significantly slower to avoid the risky, disadvantageous decks. These findings demonstrate how the ways in which we process negative emotional events shape their carryover effects in decision-making under uncertainty and point to self-distancing as a potential tool to control incidental emotional influences.

1 | Introduction

Emotions can function as important sources of information in decision-making under uncertainty where outcomes and probabilities are not explicitly known (Damasio 1996, 199; Loewenstein et al. 2001; Slovic et al. 2007). Successful traders, for example, may find that they assess risks more accurately when they rely on their emotions, which signal the expected value of different trades based on previous experiences (e.g., Kandasamy et al. 2016). In this way, emotions form the basis of learning and adaptive decision-making (Christopoulos, Uy, and Yap 2019).

The adaptive role of emotions in decision-making under uncertainty was demonstrated in a series of seminal studies by Bechara et al. (1994, 1997), using the Iowa Gambling Task. In this task, players pick a card from various decks that are associated with different levels of risk and reward and learn their expected utility through trial and error. This learning process relies on subtle bodily signals, shaped by previous choices, that mark the value of decks to guide future choices. The task has become one of the most popular paradigms for studying affective decision-making under uncertainty and has garnered substantial support for the somatic marker hypothesis (Reimann and Bechara 2010).

However, emotions can also arise from circumstances unrelated to the task (George and Dane 2016; Lerner et al. 2015; Peters et al. 2006; Västfjäll et al. 2016). These so-called incidental emotions may interfere with the aforementioned learning mechanism because the information they carry is usually irrelevant and misleading. Negative incidental emotions, particularly anger, can linger and lead to ruminative thinking, thereby reducing sensitivity to immediate and important signals that would otherwise guide choices. In addition, incidental anger, in contrast to other negative emotions like fear, leads to greater impulsivity, risk-seeking, escalation of commitment, and susceptibility to biases like anchoring (Ferrer et al. 2017; Jung and Young 2019; Lerner et al. 2003; Lerner and Tiedens 2006; Litvak et al. 2010; Tsai and Young 2010). As a result, researchers have called for studies that can identify ways

to mitigate such influences (e.g., Dorison, Klusowski et al., 2020; Lerner et al. 2015), particularly in dynamic tasks involving uncertainty where risks must be learned through experience (Ferrer et al. 2017; Reimann and Bechara 2010).

In the current study, we hypothesized that incidental anger maladaptively increases risk-taking in the Iowa Gambling Task but only when individuals reflect on the emotion-triggering situation from a self-immersed perspective, which is characterized by repetitive and ruminative thinking (e.g., Ayduk and Kross 2010; Kross and Ayduk 2008). On the other hand, adopting a self-distant perspective (see Kross and Ayduk 2017), which is known to reduce negative thought patterns (Grossmann and Kross 2014; Kross and Grossmann 2012), should weaken the carryover effect of anger. Drawing on discrete emotion theories, particularly the appraisal tendency framework (Lerner et al. 2015; Lerner and Keltner 2000), we contrast incidental anger with another similarly negative and intense emotion, namely, fear.

Overall, the current study aims to integrate, and contribute, to two distinct literatures: (a) emotion and decision-making models (especially the appraisal tendency framework) and (b) self-distancing/self-regulation models. Moreover, this study adds to the debate about the learning mechanisms in the Iowa Gambling Task (Dunn, Dalgleish, and Lawrence 2006; Maia and McClelland 2004) by specifying the interaction between emotion (incidental anger vs. fear) and cognition (self-distancing).

1.1 | Incidental Anger (vs. Fear)

Unlike integral emotions, incidental emotions do not arise from the decision-making process itself but instead carry over from past, unrelated situations (Lerner et al. 2015). As a result, incidental emotions are normatively irrelevant because the information they carry is not relevant to the task at hand. Yet, decision-makers are still influenced by them, even when economic outcomes are at stake (Lerner, Small, and Loewenstein 2004).

Fear and anger are two incidental emotions that play an important role in decisions involving risk and uncertainty. Despite being similar along the dimensions of valence and arousal (i.e., both are similarly negative and intense), they have been found to produce diverging effects on judgments and decisions involving risk. Lerner and Keltner's (2000) appraisal tendency framework (see also Lerner et al. 2015) assumes that each emotion is associated with a set of motivational and cognitive properties that cause people to interpret future events in line with the appraisals that characterize the emotion, which in turn account for differences in judgments and decisions. Thus, in contrast to fear, which is associated with appraisals of uncertainty and situational control, anger leads people to perceive lower risk, to take excessive risks, and to rely more on impulses (Ferrer et al. 2017; Gambetti and Giusberti 2012; Habib et al. 2015; Lerner et al. 2003; Lerner and Keltner 2001; Lerner and Tiedens 2006; Tsai and Young 2010). Lerner and Keltner (2000) proposed that fear and anger hold particular relevance in decisions involving risk and uncertainty because the appraisals that differentiate them, namely, appraisals of certainty and control, directly map onto two key factors in risk assessment: "unknown risk" (perceived uncertainty) and "dread risk" (perceived lack of individual control).

Because incidental emotions like fear and anger are normatively irrelevant, researchers have emphasized the need to identify strategies to mitigate their influence (Lerner et al. 2015). Incidental anger, at least relative to other negative emotions like fear, is likely a particularly disruptive emotion in a task like the Iowa Gambling Task where participants must rely on emotional markers developed through implicit learning to estimate the long-term expected value of choice alternatives (Bechara et al. 1994, 1997).

The increase in impulsiveness and risk-seeking associated with incidental anger compared to the increase in cautiousness and risk-aversion associated with incidental fear may lead individuals to make hasty decisions without thorough consideration of risks and benefits. Moreover, while fear is typically future-oriented, anger tends to stem from past experiences. Consequently, when individuals experience anger, they may be less inclined to consider the long-term consequences of their decisions, remaining fixated on past events.

In addition, incidental anger can increase escalation of commitment relative to fear (Tsai and Young 2010), which might impair the learning mechanisms that drive advantageous decision-making in the Iowa Gambling Task. This task is structured to transition from early trials marked by decision-making under uncertainty, where knowledge about the risks and benefits of each deck is limited, to later trials characterized by decision-making under risk as individuals form an intuition about risks and payoffs. However, incidentally, angry individuals might end up sticking with suboptimal choices despite mounting evidence suggesting a need for adjustment. Relatedly, in contrast to incidental fear, incidental anger has been associated with anchoring (Inbar and Gilovich 2011; Jung and Young 2019), which may cause individuals to latch onto initial, potentially irrelevant information (the anchor) and fail to adjust their decisions.

1.2 | Self-Distancing (vs. Self-Immersion)

By default, individuals tend to adopt a self-immersed perspective when reflecting on past emotional events (Kross and Ayduk 2017). For instance, an individual who receives a frustrating phone call before an important client meeting might find themselves continuously replaying the triggering event in their mind, engaging in a cycle of negative inner dialogue (e.g., Kross and Ayduk 2009). The persistent dwelling on the event may then lead to tendencies typically associated with anger, such as impulsive decision-making and risk-taking.

A growing body of research indicates that adopting a self-distant perspective diminishes tendencies like rumination and repetitive thinking about negative events (Ayduk and Kross 2010; Kross et al. 2012; Kross and Ayduk 2008). For example, individuals can de-personalize an incident that caused them anger by imagining how a distant, uninvolved observer would feel, enabling them to reflect on the situation more objectively (Grossmann and Kross 2014; Kross and Grossmann 2012). This process mirrors the common experience of finding it simpler to reason through other people's problems. In fact, self-distancing targets a fundamental appraisal that underlies individuals' responses to emotions, namely, personal relevance (Lazarus and Folkman 1984).

Relatedly, a few studies in the incidental emotion literature have examined the role of self-focus. Cryder et al. (2008) found that sadness increased spending but only among participants who were asked to recall and describe a sadness-inducing event from a personally relevant perspective (compared to a neutral condition). Dorison, Wang et al. (2020) found that sadness was linked with greater addictive substance use which was driven by higher levels of self-focus. Although the studies by Cryder et al. (2008) and Dorison, Wang et al. (2020) focused on incidental sadness and self-focus rather than incidental anger and self-immersion (vs. self-distancing), they provide further evidence for the potential effectiveness of self-distancing in reducing carryover effects of incidental emotions in general.

Finally, while a few studies have examined the role of self-distancing in decision-making (Gainsburg et al. 2022; Mayiwar and Björklund 2021; Mayiwar, Hærem, and Furnham 2023), the present study is, to our knowledge, the first attempt to experimentally investigate how self-distancing moderates the effect of incidental anger (vs. fear) in a dynamic decision-making task involving uncertainty.

2 | Transparency Statement

We report how we determined the sample size, all data exclusions, all manipulations, and all measures collected in this study. We preregistered both experiments before collecting data and completed data collection before running any analyses. We performed all analyses in RStudio 1.4.1106 (RStudio Team 2022). The data, code, materials, and supplementary results can be accessed at https://osf.io/jhdsf/. The current study was approved by SIKT, the Norwegian Agency for Shared Services in Education and Research (ethics approval number: 173763). All participants were required to provide their informed consent.

3 | Overview of Experiments

We conducted two experiments that used the same design and procedure. The first experiment was conducted online and the second experiment in a controlled laboratory setting.

Participants recalled and reflected on either a fear-related or an anger-related event using either a self-immersed or self-distanced perspective. Participants were then told that they would complete an unrelated decision-making task that was ostensibly part of a different study. This was the Iowa Gambling Task (Bechara et al. 1994), where they had to choose from four different decks of cards across 100 trials. Optimal task performance involves choosing from the two safe decks rather than the two risky decks. The task is described in greater detail in the Method section (section 4.2).

We hypothesized that incidental anger (vs. fear) would maladaptively increase risk-taking, but only among decision-makers who adopt a self-immersed (vs. self-distant) perspective. In Experiment 1, we found support for this interaction in later trials. Experiment 2 replicated this interaction in a laboratory setting.

We also tested the robustness of this interaction by (i) combining both datasets and running a mixed-effects model controlling for the experiment, (ii) using Bayesian analysis to quantify evidence in favor of the alternative hypothesis over the null hypothesis, and (iii) using an alternative traditional scoring method in the Iowa Gambling Task (net advantageous selections across five blocks of trials). All results provided support for the interaction between self-distancing, incidental emotion, and trial. These results are reported in Supporting Information S1, which also includes other results, including net monetary outcome, and descriptive plots of card selections from each deck in each of the four experimental groups.

4 | Experiment 1

4.1 | Sample

We preregistered the experiment on the Open Science Framework (link: https://osf.io/yr75s) (in both experiments, we also preregistered a hypothesis concerning information processing that we have not reported here; interested readers can find these variables in the shared datasets). We recruited participants, mainly working adults, via social media platforms (Facebook and LinkedIn). The post contained a brief description that masked the experiment's true purpose and a link to a Qualtrics survey. Participants were told that they had the chance to win a gift card worth approximately $100. To qualify, participants had to be above 18 years old and fluent in English, as the entire experiment was in English.

Our sample size was constrained by limited time and financial resources as this was part of a thesis project (Lakens 2022). These constraints led to a substantially smaller sample size than the preregistered $N = 400$. We therefore retained the full sample to increase power and thus did not implement the preregistered exclusion criteria. The main findings remain the same regardless of the exclusions. The final sample consisted of 177 participants (85 males, 82 females, two other/prefer not to answer; $M_{age} = 26.59$, $SD_{age} = 7.60$). Participants reported an average of close to 7 years of work experience ($M = 6.83$, $SD = 8.51$).

We conducted a simulated sensitivity analysis using the *simr* package (Green and MacLeod 2016) in RStudio to determine the smallest effect size the study could detect for the key tests. The code can be found in the analysis script on the OSF project page. The results from 100 simulations indicated that the current study had 80% power (with $\alpha = 5\%$, one-tailed) to detect an odds ratio of 0.40 for the anger (vs. fear) × self-distancing (vs. self-immersion) interaction and 80% power (with $\alpha = 5\%$, two-tailed) to detect an odds ratio of 0.80 for the anger (vs. fear) × self-distancing (vs. self-immersion) × trial interaction. Our study should therefore be able to detect typical effects in the literature.

4.2 | Procedure and Design

After providing their informed consent, participants received a brief "two-part" cover story to dissociate the emotion and self-distancing induction from the dependent variables. We manipulated emotions and self-distancing in a 2 (fear vs. anger) × 2 (self-immersed vs. self-distanced) between-subjects design. Forty-four participants were in the self-immersed fear condition, 43 participants in the self-distanced fear condition, 41 participants in the self-immersed anger condition, and 38 participants in the self-distanced anger condition.

The manipulation, which was administered before the decision-making task, consisted of two stages that we adapted from previous studies on incidental emotions and risk (Lerner and Keltner 2001) and studies on self-distancing (Bruehlman-Senecal and Ayduk 2015; Kross and Ayduk 2009; White et al. 2019). In the first stage, we instructed participants to recall and identify an event in their past that caused intense fear or anger. In the second stage, we instructed participants to describe their stream of thoughts about their feelings about the recalled event by adopting a self-immersed or self-distanced perspective. The instructions are shown in Table 1. Participants then completed the decision-making task, answered manipulation checks, and were debriefed.

4.3 | Iowa Gambling Task

We used a computerized version of the task adapted from the original study by Bechara et al. (1994) using PsyToolkit's library. Players see four decks of cards that they must choose from over the course of 100 trials. All decks remain available for selection throughout the entire task, such that choices on later trials can be compared with those on earlier trials.

Each time a card is drawn from one of the decks, the player either wins or loses money. Decks A and B are risky as they yield the largest rewards but also the largest losses. On the other hand, decks C and D yield the smallest rewards but also the smallest losses. The bad decks involve higher risk (as defined by the variance of the deck) than the good decks. Table 2 shows the payoff scheme in the task and each deck's risk profile. Decks A and B are risky and disadvantageous in the long run, whereas decks C and D are safer and advantageous. Players receive no information about the decks and the probabilities of their payoffs; they must rely on their own estimations of risk and determine which decks are risky and which are profitable over time.

We administered the task on PsyToolKit (Stoet 2010, 2017) using the same setup as the original study by Bechara et al. (1994). Participants were endowed with a hypothetical base loan of $2000 and were instructed to earn as much money as possible.

TABLE 1 | Emotion recall and self-perspective manipulation.

Emotion	Perspective
Fear	*Self-Immersed*
Please recall a memory of an event within the past year that made you feel fear. For instance, you might think about a specific time when you were in danger. You might have been threatened with harm and you were either uncertain about how to deal with the situation or felt unable to cope. Please note, it is important that you try your best to focus on a situation that made you feel fear and not other emotions. Once you have identified a specific event that made you very fearful, please describe the event in the text box below using only a few words ("e.g., I saw a snake").	Now that you've thought of a specific event that made you fearful [angry], imagine this very event unfold through your own eyes as if it was happening to you right now. Try to picture the event as vividly as possible. As you continue to see the situation unfold in your own eyes, please take the next couple of minutes to describe your stream of thoughts about how you feel about this event that makes you experience fear. Please provide as much detail as possible (minimum. 20 words).
Anger	*Self-Distanced*
Please recall a memory of an event within the past year that made you very angry. For instance, you might think about a specific time when someone else was to blame for something that happened to you. The person or thing who was at fault harmed you in some way or prevented you from getting something you wanted. Please note, it is important that you try your best to recall a situation that made you feel angry and not other emotions. Once you have identified a specific event that made you very angry, please describe the event in the text box below using only a few words (e.g., "My boss treated me unfairly").	Now that you've thought of a specific event that made you feel fear [anger], please take a few steps back and move away from the event to a point where it feels very distant from you. Think about the event from the perspective of a distant and uninvolved observer. Take the next couple of minutes to describe your stream of thoughts about how you feel about the specific event that made you fearful [angry] from this distant perspective. Please provide as much detail as possible (minimum. 20 words).

TABLE 2 | Payoff scheme in the Iowa Gambling Task.

	Deck A	Deck B	Deck C	Deck D
Gain	$100	$100	$50	$50
Loss	$150–$350	$1250	$50	$250
Gain/loss frequency	5:5	9:1	5:5	9:1
Expected value	−$250	−$250	$250	$250
Risk (std. dev.)	125.63	125.63	25.13	25.13

4.4 | Manipulation Checks

Participants indicated on a 7-point Likert scale (1 = *not at all*, 7 = *very much*) the extent to which they felt fearful, worried, anxious, angry, outraged, and irritated during their recall of the anger-related versus fear-related event. We averaged the first three items into a fear scale and the last three into an anger scale. Both demonstrated good reliability ($\alpha_{fear} = 0.85$, $\alpha_{anger} = 0.89$).

Finally, we tested whether participants in the distanced condition perceived greater distance from the recalled emotional event we asked them to write about during the first part of the experiment. Participants responded to the item "How far did you feel from the event you wrote about?" on a 7-point Likert scale (1 = *very near*, 7 = *very distant*).

In both experiments, we measured appraisals of certainty and control based on Lerner and Keltner (2001) and subjective ratings of valence and arousal. Consistent with Lerner and Keltner (2001), the anger group reported significantly greater perceived personal control and certainty than the fear group. Details and results are reported in Supporting Information S1.

4.5 | Results

We report one-tailed *p*-values and corresponding (normal) confidence intervals for preregistered directional hypotheses (Cho and Abe 2013) and two-tailed *p*-values and 95% (normal) confidence intervals for exploratory tests.

4.5.1 | Self-Reported Fear and Anger

An independent sample *t*-test indicated a significant difference in self-reported fear and anger between the two emotion groups. Those in the fear condition reported significantly higher fear ($M = 3.38$, $SD = 1.62$) than those in the anger condition ($M = 2.55$, $SD = 1.39$), $t(175) = 3.64$, $p < 0.001$ (one-tailed), $d = -0.55$, 90% CI = −0.80, −0.30. Those in the anger condition reported significantly higher anger ($M = 4.18$, $SD = 1.52$) than those in the fear condition ($M = 2.55$, $SD = 1.59$), $t(175) = -6.94$, $p < 0.001$ (one-tailed), $d = 1.05$, 90% CI = 0.78, 1.31. We also explored whether self-distancing influenced self-reported fear and anger (see Supporting Information).

4.5.2 | Perceived Distance

An independent sample *t*-test indicated that perceived distance significantly differed between the self-immersed and self-distanced groups, $t(175) = -1.86$, $p = 0.032$ (one-tailed), $d = 0.28$, 90% CI = 0.03, 0.53. Perceived distance from the recalled event was higher in the self-distanced group ($M = 4.24$, $SD = 1.52$) compared to the self-immersed group ($M = 3.80$, $SD = 1.64$).

4.5.3 | Hypothesis Testing

We ran logistic mixed-effects models using the *lme4* package (Bates et al., 2015) . Each participant had 100 responses on the dependent variable (risk-taking). Continuous predictors were mean-centered before running the analyses (Aiken, West, and

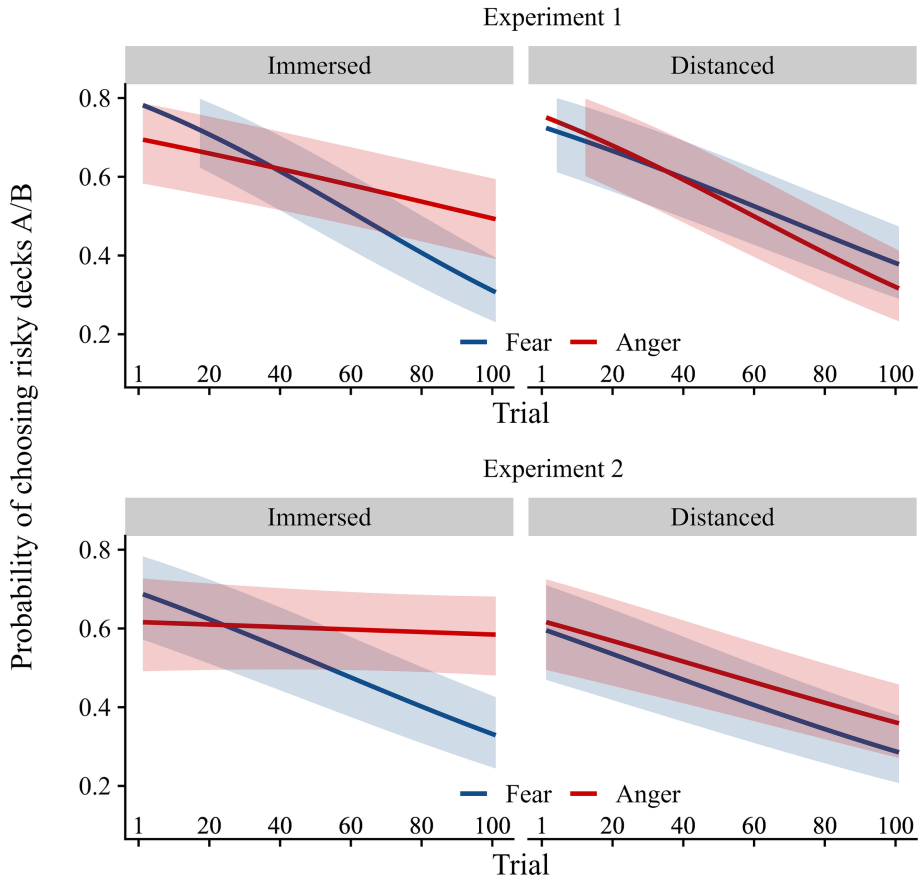

FIGURE 1 | Interaction between anger (vs. fear), self-distancing (vs. self-immersion), and trial in Experiment 1 (top row) and Experiment 2 (bottom row).

Reno 1991). For the emotion and distancing dummy variables, we used effect coding (−0.5/+0.5) (Singmann and Kellen 2019).

For ease of interpretation, we report the odds ratio instead of the standard coefficient in logistic regression, which represents a log-odds ratio. The odds ratio captures changes in the probability of the event corresponding to a 1-unit change of the predictor. For example, an odds ratio of 1.5 means that the probability of the event is 1.5 times higher (or 50%). Values below 1 indicate a negative impact (reduction in odds ratio), values above 1 indicate a positive impact (increase in odds ratio), and a value of 1 indicates no change in odds ratio.

We ran two logistic mixed effects models. The first was our preregistered model that included fixed factors for the interaction between emotion and self-distancing and random factors for subjects and trials. In the second (exploratory) model, we included trial as a fixed effect along with its interaction with anger (vs. fear) and self-distancing (vs. self-immersion). This allowed us to directly examine participants' learning of rewards and losses over time, a standard approach in studies using the Iowa Gambling Task (e.g., Bechara et al. 2001). To use trial as a quantitative variable and to model learning as a linear function, we log-transformed the trial variable, following previous studies (e.g., Perandrés-Gómez et al. 2021). Next, we z-standardized trial with standard deviation as the unit, which is generally recommended for predictors of this type to prevent convergence problems (Jara-Rizzo et al. 2020). For presentation purposes, Figure 1 shows the original 1–100 scale for trial. The results from the logistic mixed effects model in Experiment 1 are summarized in Table 3.

In the first model (across trials), there was a significant interaction between incidental anger (vs. fear) and self-distancing (vs. self-immersion). In the exploratory model, we also found a significant incidental anger (vs. fear) × self-distancing (vs. self-immersion) × trial interaction. As shown in Figure 1 (top row), the predicted interaction between incidental emotion and self-distancing gradually strengthened over trials and became strongest in the last trials. That is, among self-immersed participants, the probability of selecting from risky decks did not decrease as rapidly among those in the anger condition, compared to participants in the fear condition.

We probed the interaction using simple slopes analysis (with Bonferroni adjustment). The results, summarized in Table 4, indicate that in the self-immersed condition, the effect of anger (vs. fear) was positive but not significant in the early trials but became significant in the final trials. The simple slopes in the self-distanced group were not significant.

4.6 | Discussion: Experiment 1

Experiment 1 provided support for the hypothesis that incidental anger is associated with greater risk-taking compared to incidental fear, but only when decision-makers adopt a self-immersed perspective. Notably, we found a significant by-trial interaction,

TABLE 3 | Summary of logistic mixed effects models (Experiment 1).

	Model 1: Across trials			Model 2: By-trial interaction		
Predictors	**Odds ratios**	**CI**	***p***	**Odds ratios**	**CI**	***p***
(Intercept)	0.69	0.47–1.01	0.057	0.69	0.47–1.00	0.053
Anger (vs. fear)	1.69	1.06–2.69	0.033	1.69	0.97–2.95	0.065
Distanced (vs. immersed)	1.20	0.76–1.89	0.258	1.20	0.70–2.07	0.508
Anger (vs. fear) × Distanced (vs. immersed)	0.49	0.25–0.96	0.041	0.49	0.22–1.09	0.080
Trial				0.66	0.61–0.70	<0.001
Trial × Anger (vs. fear)				1.28	1.17–1.41	<0.001
Trial × Distanced (vs. immersed)				1.13	1.03–1.25	0.010
Trial × Anger (vs. fear) × Distanced (vs. immersed)				0.72	0.63–0.82	<0.001
Random effects						
σ^2	3.29			3.29		
τ_{00}	1.73_{subject}			1.74_{subject}		
	0.11_{trial}					
ICC	0.36			0.35		
N	177_{subject}			177_{subject}		
	100_{trial}					
Observations	17,700			17,700		
Marginal R^2/Conditional R^2	0.009/0.364			0.030/0.365		

Note: One-tailed *p*-values and 90% confidence intervals are shown for the predictors in Model 1. Two-tailed *p*-values and 95% confidence intervals are shown for the predictors in Model 2.

TABLE 4 | Results from simple slopes analysis (Experiment 1).

Condition	Trial phase	Odds ratio [95% CI]	Cohen's *d*	*p*-value
Self-immersed	Early trials	1.32 [0.75, 2.31]	0.15	1
Self-immersed	Last trials	2.17 [1.23, 3.81]	0.43	0.029
Self-distanced	Early trials	0.90 [0.51, 1.60]	−0.06	1
Self-distanced	Last trials	0.76 [0.43, 1.36]	−0.15	1

Note: *p*-values are Bonferroni adjusted. Odds ratios were converted to Cohen's *d* using the *effectsize* package (Ben-Shachar, Lüdecke, and Makowski 2020).

indicating that the moderating effect of self-distancing gradually strengthened across trials and was strongest in the last trials. However, the by-trial interaction shown in Figure 1 was exploratory and thus necessitates a replication.

Additionally, the online nature of the experiment might have introduced noise, given the limitations in controlling environmental disturbances inherent in such settings (e.g., multitasking, interruptions, and other distractions). This raises the need for replication in a controlled laboratory setting that can isolate such disturbances.

5 | Experiment 2

We ran the second experiment in a controlled laboratory setting. Participants were seated in isolated rooms and completed the emotion and distancing manipulation using paper and pen (see Supporting Information S1 for an image of the experimental setting).

5.1 | Sample

We preregistered our experiment on the Open Science Framework (link: https://osf.io/c6ft4). Participants were mainly students at a business school in Norway. To qualify, participants had to be above 18 years old and fluent in English. Participants were informed that they had the chance to win a gift card worth approximately $100. Our sample size was constrained by the limited resources (Lakens 2022). We preregistered a target sample size of 200 participants. A total of 150 people participated in the laboratory experiment. Six participants did not complete the decision-making task, leaving us with a final sample size of 144 (73 males, 71 females, $M_{age} = 26.17$, $SD_{age} = 8.00$). Participants had, on average, 8 years of work experience ($SD = 11.74$).

Using the same procedure in Experiment 1, we conducted a sensitivity analysis to determine the smallest effect size this study could detect for the key tests. These results were similar to Experiment 1. The study had 80% power (with $\alpha = 5\%$, one-tailed) to detect an odds ratio of 0.38 for the anger (vs. fear) × self-distancing (vs. self-immersion) interaction and 80% power (with $\alpha = 5\%$, two-tailed) to detect an odds ratio of 0.78 for the anger (vs. fear) × self-distancing (vs. self-immersion) × trial interaction.

5.2 | Procedure and Design

We used the same design and measures as in Experiment 1, with the only difference being that participants completed the emotion and self-distancing component using paper and pen. Twenty-seven participants were in the self-immersed fear condition, 28 participants in the self-distanced fear condition, 33 participants in the self-immersed anger condition, and 32 participants in the self-distanced anger condition.

Scale reliabilities were similar to those in Experiment 1: self-reported fear ($\alpha = 0.88$) and self-reported anger ($\alpha = 0.90$).

In Experiment 2, we also recorded participants' skin conductance response as an additional manipulation check. Self-distancing significantly reduced physiological arousal during the stream-of-thoughts task. Details and results are reported in Supporting Information S1.

5.3 | Results

5.3.1 | Self-Reported Fear and Anger

Those in the fear condition reported significantly higher fear ($M = 3.69$, $SD = 1.76$) than those in the anger condition ($M = 2.69$, $SD = 1.47$), $t(142) = 3.73$, $p < 0.001$ (one-tailed), $d = -0.63$, 90% CI = −0.91, −0.34. Similarly, those in the anger condition reported significantly higher anger ($M = 4.13$, $SD = 1.48$) than those in the fear condition ($M = 2.31$, $SD = 1.41$), $t(142) = -7.52$, $p < 0.001$ (one-tailed), $d = 1.26$, 90% CI = 0.96, 1.56.

5.3.2 | Perceived Distance

Participants who reflected on their fear or anger-eliciting event from a distanced perspective reported significantly greater perceived distance ($M = 4.36$, $SD = 1.44$) than the immersed participants ($M = 3.68$, $SD = 1.55$), $t(142) = -2.73$, $p = 0.004$ (one-tailed), $d = 0.46$, 90% CI = 0.18, 0.73.

5.4 | Hypothesis Testing

We ran the same logistic mixed effects models as in Experiment 1. The results are summarized in Table 5. The interaction between anger and self-distancing was not significant. However, as in Experiment 1, we found a significant by-trial interaction. As shown in Figure 1 (bottom row), self-immersed angry participants consistently selected from the risky decks.

The results from the simple slopes analysis (with Bonferroni adjustment), shown in Table 6, were similar to those in Experiment 1.

6 | General Discussion

The current study examined how self-distancing regulates the influence of incidental anger (vs. fear) in affective decision-making under uncertainty. We found that incidental anger led

TABLE 5 | Summary of logistic mixed effects models (Experiment 2).

	Model 1: Across trials			Model 2: By-trial interaction		
Predictors	**Odds ratios**	**CI**	***p***	**Odds ratios**	**CI**	***p***
(Intercept)	0.67	0.45–1.01	0.057	0.67	0.45–1.01	0.055
Anger (vs. fear)	2.16	1.33–3.50	0.004	2.15	1.21–3.84	0.009
Distanced (vs. immersed)	0.78	0.48–1.27	0.203	0.78	0.44–1.40	0.407
Anger (vs. fear) × Distanced (vs. immersed)	0.62	0.31–1.22	0.123	0.62	0.27–1.40	0.249
Trial				0.74	0.69–0.80	<0.001
Trial × Anger (vs. fear)				1.32	1.18–1.46	<0.001
Trial × Distanced (vs. immersed)				1.04	0.94–1.16	0.464
Trial × Anger (vs. fear) × Distanced (vs. immersed)				0.80	0.69–0.93	0.003
Random effects						
σ^2	3.29			3.29		
τ_{00}	1.50_{subject} 0.05_{trial}			1.49_{subject}		
ICC	0.32			0.31		
N	144_{subject} 100_{trial}			144_{subject}		
Observations	14,400			14,400		
Marginal R^2/Conditional R^2	0.029/0.339			0.039/0.339		

Note: One-tailed *p*-values and 90% confidence intervals are shown for the predictors in Model 1. Two-tailed *p*-values and 95% confidence intervals are shown for the predictors in Model 2.

TABLE 6 | Results from simple slopes analysis (Experiment 2).

Condition	Trial phase	Odds ratio [95% CI]	Cohen's *d*	*p*-value
Self-immersed	Early trials	1.64 [0.91, 2.94]	0.27	0.402
Self-immersed	Last trials	2.84 [1.57, 5.09]	0.57	0.002
Self-distanced	Early trials	1.26 [0.70, 2.27]	0.13	1
Self-distanced	Last trials	1.40 [0.78, 2.52]	0.18	1

Note: p-values are Bonferroni adjusted. Odds ratios were converted to Cohen's *d* using the *effectsize* package (Ben-Shachar, Lüdecke, and Makowski 2020).

to riskier and more disadvantageous choices compared to incidental fear when decision-makers adopted a self-immersed perspective. This suggests an impairment in learning task-relevant cues and reduced sensitivity to previous losses, leading to choices with unfavorable consequences. In contrast, among self-distanced decision-makers, angry and fearful decision-makers exhibited similar learning curves. This effect emerged without instructing participants to minimize their emotions or providing information about how to approach the task; they were simply instructed to adopt a self-distant (vs. self-immersed) perspective while reflecting on the emotion-eliciting event.

6.1 | Theoretical Implications

Unlike tasks that provide explicit information about outcomes and probabilities, the Iowa Gambling Task relies on emotional markers developed through implicit learning, allowing participants to estimate the long-term expected value of choice alternatives (Bechara et al. 1994, 1997). Central to this process is the somatic marker hypothesis (Damasio 1996), suggesting an unconscious interplay between emotion and cognition. While speculative, the present study suggests that self-distancing might facilitate such coordination, diminishing susceptibility to incidental emotions while amplifying sensitivity to task-relevant cues that help them discriminate between advantageous and disadvantageous choices. The attenuation of incidental emotional effects through self-distancing may be attributed to a lower tendency to engage in rumination and repetitive thinking. Consequently, decision-makers might be better able to concentrate on the task at hand without being influenced by negative and intrusive thoughts triggered by prior situations unrelated to the task.

On a related note, the current findings add to a longstanding debate about the learning mechanisms involved in the Iowa Gambling Task. Critics have challenged the cognitive

impenetrability assumption of the somatic marker hypothesis, suggesting that learning may be driven by explicit cognitive processes rather than implicit emotional cues (e.g., Dunn, Dalgleish, and Lawrence 2006; Maia and McClelland 2004). Our observation that self-distancing, a cognitive tactic, moderates the impact of incidental emotions suggests the potential for an interplay between explicit cognitive processes and implicit emotional cues in decision-making.

Furthermore, our results point to a boundary condition of incidental emotion effects and may help reconcile mixed findings in the literature (see meta-analyses by Bartholomeyczik, Gusenbauer, and Treffers 2022; Ferrer and Ellis 2021; Marini 2023). Specifically, the differential influence of incidental anger and fear as proposed by the appraisal tendency framework (Lerner et al. 2015; Lerner and Keltner 2000) may be especially likely when decision-makers perceive emotion-inducing events as personally relevant. Thus, adopting the perspective of a distant impartial observer might reduce the effect of incidental emotions like anger by reducing the perceived personal relevance.

The current findings also contribute to the literature on incidental emotions and decision-making by focusing on decision-making under uncertainty where outcomes and probabilities are not explicitly known. As noted by Ferrer et al. (2017), studies on incidental emotions have typically focused on tasks that provide explicit information about probabilities and outcomes—in other words, where decision-makers must assess risks deliberately rather than experientially. Indeed, "it seems plausible that anger's effect on deliberative risk perceptions may not precisely correspond to its effects on risk-taking in a dynamic paradigm where risks are learned experientially over time" (Ferrer et al. 2017, 524).

Finally, these findings build on the self-distancing literature by showing its relevance in the domain of decision-making. Only a few studies have examined the role of self-distancing in decision-making (Gainsburg et al. 2022; Mayiwar and Björklund 2021; Mayiwar, Hærem, and Furnham 2023). The current study is the first to examine how self-distancing regulates the influence of incidental anger versus fear in a dynamic task that simulates real-life decision-making under uncertainty.

6.2 | Practical Implications

Although incidental emotions often influence decision-makers, they are usually unaware of such emotional influences and regard them as unwanted (Lerner et al. 2015). Our study indicates that self-distancing—a tactic that requires little effort (Moser et al. 2017)—may serve as an efficient tool to mitigate unwanted incidental emotional influences and thereby help decision-makers navigate uncertain and emotionally charged situations.

It is important to note that self-distancing does not involve avoiding or suppressing one's emotions. Doing so can even increase the intensity of the experienced emotion (Goldin et al. 2008), ultimately amplifying the emotion's carryover effect. Instead, self-distancing requires attending to one's emotions, but without allowing them to dictate one's behavior. Thus, implicit or explicit norms that discourage experiencing and expressing emotions can have unintended negative consequences for decision-making (Ashkanasy and Dorris 2017). This can become particularly problematic in organizations that frequently deal with high-stake decisions under conditions of uncertainty.

6.3 | Limitations and Future Research

The current study has several limitations that merit attention, some of which point to potential directions for future research. First, the sample size in each of the two experiments was small. This is particularly important given that the key test involved a three-way interaction. Thus, well-powered replications are needed to test the robustness of the current findings. Nevertheless, the results remained identical when we combined the data across experiments and ran the same mixed-effects model (while also including "experiment" as a random factor). Bayesian analysis also provided evidence for the alternative hypothesis over the null hypothesis. In addition, we obtained the same results when using the traditional scoring approach in the Iowa Gambling Task (net advantageous selections across five blocks of trials). These additional results are reported in Supporting Information S1. Taken together, these results provide support for a moderating effect of self-distancing on incidental anger (vs. fear) during the last trials in the Iowa Gambling Task.

Moreover, while we used a very common method to induce self-distancing, future studies might want to test alternative methods. Psychological distance manifests across multiple dimensions, including physical, social, and temporal distance (Moran and Eyal 2022; Powers and LaBar 2019). Consequently, a self-distant perspective can be induced along any one of these dimensions of psychological distance, theoretically speaking. For instance, imagining that one is making decisions for someone else rather than oneself or imagining the consequences of one's decision in the distant future might help decision-makers reduce the influence of incidental emotions (e.g., Raghunathan and Pham 1999). It is also worth mentioning that the recall task used in the current experiments, a common method of inducing incidental fear and anger, likely produces rather mild emotional responses. Individuals might prefer other emotion regulation strategies, such as distraction or expressive suppression, in more emotionally intense situations.

Finally, it is not within the scope of this study to determine whether self-distancing from incidental anger is inherently beneficial, as this will ultimately depend on the context. Overall, we hope to see future well-powered studies that test how the current findings generalize across different tasks and manipulations.

7 | Conclusion

Self-distancing regulated the influence of incidental anger (vs. incidental fear) on decision-making under uncertainty. Specifically, angry (vs. fearful) decision-makers were slower to learn to avoid the risky, disadvantageous decks, but only

among those who reflected on the emotion-eliciting event from a self-immersed perspective. When decision-makers distanced themselves from their emotions, the learning curves for fear and anger were similar.

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Data Availability Statement

Preregistration, data, code, and materials can be accessed at https://osf.io/jhdsf/.

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Supporting Information

Additional supporting information can be found online in the Supporting Information section.