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The Sure Thing: The Role of Integral Affect in Risky Choice Framing

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When faced with a decision, certain aspects of the decision itself shape our affective responses to choice options, which, in turn, influence our choices. These integral affective influences manifest as immediate feelings about choice options as well as the feelings that we anticipate we will feel after certain potential outcomes. We examined whether the effect of framing on risk taking can be explained through the mediating roles of immediate and anticipated affect. Two experiments were conducted using a gambling task. On each trial, participants were endowed a sum of money (e.g., \$25) then presented with a choice between a sure option (leaving them with a portion of the initial endowment) and a gamble option (that could result in either keeping or losing the entire endowment). The sure option was framed differently across two within-participant conditions: as a gain (keep \$20 from \$25) or loss (lose \$5 from \$25). Experiment 1 examined whether immediate feelings toward choice options explain how framing the sure option as a loss versus a gain increases risk taking. Experiment 2 examined whether immediate and/or anticipated affect explain how framing guides risk taking. We found that the tendency to take risks to avoid sure losses was explained by immediate (not anticipated) affective evaluations of the sure option only. Individuals tended to take more risks when faced with sure losses due to greater negative immediate feelings that were evoked by sure losses relative to sure gains.

Keywords: integral affect, immediate affect, anticipated affect, framing, risk taking

Affect plays an important role in how we make decisions, especially under conditions of risk (Bechara & Damasio, 2005; Damasio, 1994; Loewenstein, Weber, Hsee, & Welch, 2001; Slovic, Finucane, Peters, & MacGregor, 2004). Decisions can evoke affect through multiple pathways, and often affect is integral to decisions during deliberation. How we expect to feel based on the potential outcomes of a choice can be described as anticipated affect (Loewenstein et al., 2001). In contrast, feelings toward choice options themselves are considered immediate affect, which motivates decision makers to either approach or avoid various decision options (Schlösser, Dunning, & Fetchenhauer, 2013). Both immediate and anticipated affect can influence the ultimate decision—and are thus integral to the decision itself. As such, these manifestations of affect may play a role in risk-related decision making, yet have rarely been examined simultaneously (Schlösser et al., 2013). The current experiments examined the potential role of these affective influences on framed decisions involving risk.

One notable decision-making bias involves findings that people often demonstrate a strong tendency to choose a risky option instead of a certain option when the certain option is framed as a

loss (lose \$70 out of \$100) as compared with a gain (keep \$30 out of \$100). There are multiple cognitive explanations for the underlying mechanisms of framing (see, e.g., Kahneman & Tversky, 2000; Reyna, 2004). Nonetheless, affective explanations of framing have also emerged (Cheung & Mikels, 2011; De Martino, Kumaran, Seymour, & Dolan, 2006) and are acknowledged by one of the initial purveyors of the framing effect (Kahneman & Frederick, 2007). Although evidence suggests a role for affect in the framing effect, its precise role in the effect remains unclear. The following studies examined how frame-dependent affective reactions to choice options predict risk-taking behavior, and if anticipated and/or immediate affect explain the effect of framing on risk taking. In other words, the aim of this work was to determine whether differences in anticipated and/or immediate affect explain increased risk taking in loss frames relative to gain frames.

Affect and Risky Decision Making

Decision theorists have traditionally posited that decisions with uncertain outcomes are made solely by weighing the probabilities and the severity of favorable and unfavorable outcomes (e.g., Savage, 1954). Such accounts have been reconceptualized considering findings that affect influences rational calculations of risk in numerous ways (for a review, see Lerner, Li, Valdesolo, & Kassam, 2015). Integral affect arises in response to one or more components of a decision and can be used as an information-bearing heuristic, which has been shown to influence risk seeking (e.g., Bechara, Tranel, Damasio, & Damasio, 1996; Denburg, Recknor, Bechara, & Tranel, 2006; Peters & Slovic, 2000; Schwarz & Clore, 2007; Slovic, Peters, Finucane, & Macgregor, 2005). Integral affect is typically elicited by a previous experience with similar task characteristics that are incorporated into the

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decision process guiding future choices (i.e., the *affect as information* perspective: Schwarz, 2002, 2011). According to research supporting the *affect heuristic*, positive integral feelings toward decision targets are associated with higher perceived benefits and lower perceived risk (e.g., Alhakami & Slovic, 1994; Finucane, Alhakami, Slovic, & Johnson, 2000). In contrast, negative integral feelings toward decision targets result in lower perceived benefits and higher risk perceptions.

Integral affect can arise from multiple components of a decision (e.g., Bechara et al., 1996; Schwarz & Clore, 2007; Slovic et al., 2005). For instance, individuals may forecast how they will feel in the case that certain desirable or undesirable outcomes result from their decision. Such experiences have been conceptualized as anticipated affect and are based on considerations of potential positive or negative future consequences (Loewenstein et al., 2001). Researchers examining the influence of anticipated affect on risk seeking have found that anticipated positive affect toward an outcome is influenced by the potential outcome of the unselected option (Mellers, 2000; Mellers & McGraw, 2001). More recent work has shown that the likelihood of risk taking was influenced by the anticipation of negative emotion (i.e., regret) related to the prospect of not taking a risk that would lead to a favorable outcome (Chen & Ma, 2009). Specifically, the more regret that participants anticipated they would feel, the greater their likelihood of risk taking.

These select findings are part of a larger body of research that examines how affect related to potential outcomes of a decision influence the decision process. This *consequentialist perspective* has dominated research investigating the role of affect in decision making (Schlösser et al., 2013). In contrast to these outcome-focused manifestations of integral affect, some research has shown that aspects of decisions can influence our immediate affect, or, in other words, the present feelings that we have about choice options that we can use to make a decision (Loewenstein, 2000). Immediate affect does not necessarily require the consideration of potential outcomes to shape the extent to which an individual is drawn toward one option over another. Although both immediate and anticipated affect can impact risk-seeking behavior, to our knowledge, only Schlösser and colleagues (2013) have directly compared the influence of immediate and anticipated integral affect. In particular, they found that immediate affect and anticipated affect both predict risk taking, but immediate affect—in some cases—predicted risk taking beyond the influence of anticipated affect. However, there has been no comparison of the role of immediate and anticipated feelings in risky choice framing. Examining these two types of integral affective responses can allow us to uncover affective mechanisms that may underlie loss aversion, or the tendency to seek risks to avoid certain losses.

The Role of Affect in the Risky Choice Framing Effect

The framing effect was introduced to the scientific community by Kahneman and Tversky (1979) and has since been consistently replicated for over more than 30 years. The framing effect illuminates how individuals' choices are influenced by the presentation of options and is an illustration of biased decision making. The framing effect describes a pattern in which the tendency to take a risk is greater if the alternative option is framed as a certain loss rather than a mathematically equivalent certain gain. Observed

behavior in framing tasks contradicts the propositions of utility theory, which posits that individuals evaluate choice options strictly as a function of probability and outcome. According to utility theory, a decision maker chooses the prospect that offers the highest expected utility. Framing violates utility theory's axiom of description invariance, which explains that the same problem should be evaluated in the same manner regardless of the way in which it is described and that choices should not be influenced by the description of equivalent alternatives.

Risky choice framing tasks, in which participants choose between sure and risky options, are commonly used to examine the framing effect. In some versions of these tasks (e.g., De Martino et al., 2006), participants are endowed with an initial sum of money and then must select between a guaranteed "sure option" and a risky "gamble option." The gamble option may result in either winning or losing the entire initial endowment. The sure option allots participants with a portion of their initial endowment and is described differently between two framing conditions. In the gain frame condition, the sure option presents the choice in terms of a gain (keep \$25 out of an initial endowment of \$100). In the loss frame condition, the sure option is presented as the mathematically equivalent loss (lose \$75 out of an initial endowment of \$100). When the sure option is framed in terms of a gain, participants are typically risk averse. Alternately, when the sure option is framed as a loss, participants often prefer choosing the risky gamble option. This pattern of behavior exemplifies a "loss averse" strategy in which decision makers predict that the negative consequences of a loss will be more impactful than the benefits of an equivalent gain (Kermer, Driver-Linn, Wilson, & Gilbert, 2006). Several studies have examined the role of affect in risky choice framing. De Martino and colleagues (2006) utilized fMRI to measure the neural activation of participants as they completed a monetary risky choice framing task. Greater neural activity in the amygdala (a brain region commonly associated with emotional processing) was observed when participants' choices were consistent with the framing effect (i.e., risk taking in a loss frame and risk avoidance in a gain frame). However, choices that were inconsistent with a framing bias were related to an increased activity in the prefrontal cortex, a brain region commonly associated with deliberative processes.

Additional insight into the role of affect in the framing effect has been garnered from behavioral findings (Cheung & Mikels, 2011). Using the same task as De Martino and colleagues (2006), Cheung and Mikels (2011) found that individuals were less risk taking when instructed to not let their emotions influence their choices in comparison with individuals who were instructed to make their decision using their emotions. Importantly, the emotion-focused group that considered their immediate feelings toward the choice options performed no different from a control group that was given no instructions. This suggests that individuals may naturally consider their immediate affective responses toward choice options in a framing paradigm. A second study reported by Cheung and Mikels (2011) used "affect probes" to measure if participants felt differently about the decision in gain versus loss frames. Integral positive affect about the decision significantly predicted risk taking in the loss frames. This study suggests that the framing manipulates integral affective reactions that are related to risk-taking behavior. However, it is not clear whether the integral affect probe used by Cheung and Mikels (2011) was assessing immediate

or anticipated affect. For instance, it is possible that the relation of positive integral affect to risk taking was a function of participants' predictions of how they would feel if the gamble won (i.e., anticipated affect), given that more positive evaluations were made when they selected the gamble option in the loss frames. Moreover, the affect probe required participants to evaluate the decision overall, rather than the individual options in the decision scenario. Thus, it is unclear whether the elevated risk taking in loss frames was due to the influence of the frame on integral affective responses toward individual choice options. Potentially, the association between positive affect and risk taking found by Cheung and Mikels (2011) was driven by greater positive feelings toward the gamble option. Alternately, Kahneman and Frederick (2007) suggest that sure gains are more attractive than sure losses when the sure option is pitted against a gamble option with uncertain probabilities.

Extending Cheung and Mikels (2011), research investigating the role of affect in risky choice framing found that immediate affect toward choice options differs between gain and loss frames (Stark, Baldwin, Hertel, & Rothman, 2017). Specifically, they found that both sure and gamble options were perceived as more appealing within a gain frame compared with a loss frame. Most importantly, utilizing a mediation analysis, they found that immediate affective evaluations of the choice options explained the effect of frame on choice. Overall, this finding suggests that frame influences immediate feelings about choice options, which, in turn, influences whether the sure or gamble option is chosen. However, Stark and colleagues (2017) did not contrast the role of anticipated and immediate affective evaluations within framing. Taking into consideration the role of anticipated affect in risky decision making (Chen & Ma, 2009; Mellers, 2000; Mellers & McGraw, 2001) and the role of immediate and anticipated affect in risk taking (Schlösser et al., 2013), it is important to consider the role of both forms of integral affect in explaining the framing effect. Potentially, anticipated affect could also change by frame and play a unique role in explaining the effect of frame on choice.

In sum, this converging evidence suggests that immediate affect plays a central role in the influence of frame on choice. However, considering the pervasive influence of the consequentialist perspective on role of affect in risk decision making broadly, contrasting anticipated and immediate affect is necessary to provide a comprehensive account of integral affect in risky choice framing.

Present Investigation Into the Role of Integral Affect in the Risky Choice Framing Effect

The research reviewed above suggests that the framing of the sure option evokes an integral affective response that is associated with the tendency to either seek or avoid risk. More work is needed to determine whether framing influences integral affective responses to the sure option and/or the risky option. Furthermore, do frame-dependent integral feelings explain the pattern of loss aversion in the risky choice framing effect? Moreover, does framing guide choice behavior by shaping immediate or anticipated affect, or both? The following experiments address these questions directly. Similar to Stark and colleagues (2017), Experiment 1 explored whether immediate affect toward the sure or gamble options can explain the effect of framing on risk taking. Experiment 2 extended Experiment 1 and examined whether immediate and/or

anticipated affective evaluations of choice options can explain the effect of framing on risk taking.

Experiment 1: Immediate Feelings Toward Sure and Gamble Options in Risky Choice Framing

This study examined if immediate feelings toward gain- versus loss-framed choice options could explain the effect of frame on risk taking in a risky choice gambling task. We used affect probes to measure immediate affective responses to choice options for each trial as participants actively engaged in a gambling task. These probes were presented prior to participants' decision. Although the results of Cheung and Mikels (2011) may be extrapolated to suggest that loss aversion occurs because of more positive feelings toward gamble options in the loss frame, we predicted that a different pattern would emerge when measuring feelings toward each individual choice option. Our predictions are derived from the work of Kahneman and Frederick (2007), Schlösser and colleagues (2013), and Stark and colleagues (2017). We predicted that immediate feelings toward the sure option and not the gamble option would underlie the pattern of loss aversion in the framing effect. Specifically, we predicted that frame-dependent immediate feelings toward the sure option would predict gambling behavior in risky choice framing.

Method

Participants. DePaul University undergraduates ($N = 32$; 26 women and 6 men) ranging in age from 18 to 24 ($M = 19.42$, $SD = 1.88$) participated for course credit. Sample sizes for this experiment as well as the subsequent experiments were determined for adequate power based on the sample sizes reported in Cheung and Mikels (2011). This experiment was approved by the DePaul University Institutional Review Board (JM050415PSY).

Materials

Gambling task. The gambling task was adapted from De Martino and colleagues (2006), consisting of a computerized task that required participants to repeatedly choose between two simultaneously presented options: a sure option on the left and a gamble option on the right. At the beginning of each trial in the task, participants were endowed a sum of money ranging from \$25 to \$100 in increments of \$25. Sure options were framed differently across the two within-subject conditions. For the *gain condition* trials, the sure option was framed in terms of gains (e.g., keep \$20), while for the *loss condition* trials, the sure option was framed in terms of losses (e.g., lose \$5). The gain and loss conditions were counterbalanced such that the result of choosing the sure option would be mathematically equivalent between frames. The gamble option had set probabilities for losing or keeping the entire endowed sum (e.g., 80% chance of keeping all and 20% chance of losing all). Pie charts represented the gamble options and depicted outcome probabilities ranging from 20% to 80% in increments of 20%. For each choice situation, gamble option probabilities were equivalent to the expected outcomes of the sure option. Endowment amounts and pie-chart probabilities were counterbalanced between the two frame conditions.

Upon being presented with the choice options, participants first responded to the question "How do you feel about the choice on the left?" (sure option) by pressing the appropriate key for a

7-point Likert-type scale ranging from -3 (*very negative*) to $+3$ (*very positive*). They next answered the same question on the same Likert-type scale about the choice on the right (gamble option). After answering these questions about their immediate feelings toward the options, participants were then asked to choose between the gamble and the sure option and made their choices by pressing designated keys on a keyboard. Prior to all analyses, the 7-point Likert scale measuring immediate affect ranging from -3 to $+3$ was recoded to a 1 (*very negative*) to 7 (*very positive*) point scale.

In total, each participant completed 96 trials or choice situations: 32 trials with gain-framed sure options, 32 trials with loss-framed sure options, and 32 catch trials for which expected sure option outcomes and gamble probabilities were not equivalent. For these catch trials, the sure option outcomes were to keep/lose 50% of the endowment whereas the gamble options offered a 95% or 5% chance of keeping/losing the entire endowment. These catch trials were included to ensure active participant engagement in the task; outcomes were skewed so that either the sure or gamble option represented a clearly optimal choice.

Positive and Negative Affect Schedule—State Version (PANAS). The PANAS (Watson, Clark, & Tellegen, 1988) is a 20-item measure of state affect. Participants were instructed to rate the extent they were currently feeling each emotion using a 5-point scale from 1 (*very slightly or not at all*) to 5 (*extremely*). Positive and negative items were averaged for positive and negative aggregate scores for each participant. Afterward, the negative average was subtracted from the positive average to get an overall measure of state affect. The PANAS was administered at the beginning of the study to account for the influence of current state affect on the gambling task.

Apparatus. The task was presented on a 19-in. LCD screen using a Dell (Dell, Round Rock, TX) desktop with E-Prime experimental software (Psychology Software Tools, Sharpsburg, PA) and a standard keyboard.

Procedure. Upon arrival, participants were seated at a desk with a computer and keyboard, completed a consent form and then completed the PANAS. Next, participants read the gambling task instructions and were informed that they would receive a sum proportional to their total winnings at the end of the study session. These instructions were included to ensure that the task was personally meaningful to the participants. Participants then completed the gambling task.

Results

A series of analyses examined if there was an effect of gain versus loss frame on risk taking and immediate affective evaluations of the sure and gamble options. We also examined whether differences in affective evaluations of the choice options between frames could explain risk taking in the task. Although the integral affect ratings were made on a -3 to $+3$ scale, for ease of presentation and analysis, we recoded the ratings on a 1 to 7 scale (this recoding was used in the subsequent experiments as well). Also, all analyses were conducted with and without controlling for state affect as measured by the PANAS. State affect did not change the pattern of results regarding integral affect or risk taking. As such, the analyses are reported without controlling for state affect.

The effect of frame on risk taking. A one-way repeated-measures analysis of variance (ANOVA) examined if there were

differences in risk taking between the gain and loss frames. The dependent variable in the analysis was the proportion of trials on which participants selected the gamble option. The proportions could range from 0 (indicating a purely risk-averse pattern) to 1 (indicating a purely risk-seeking pattern). Results indicated that participants were more likely to choose the gamble option in the loss frame ($M = .56$, $SD = .25$) than in the gain frame ($M = .40$, $SD = .22$), $F(1, 31) = 26.85$, $p < .001$, $\eta^2 = .464$.

The effect of frame on immediate feelings toward sure and gamble options. A 2×2 repeated-measures ANOVA examined whether participants' immediate feelings toward the choice options (sure vs. gamble) prior to their decision differed as a function of frame. A significant main effect of framing condition was found such that participants reported feeling more negatively about the options in the loss frame ($M = 3.37$, $SD = .46$) compared with the gain frame ($M = 3.89$, $SD = .59$), $F(1, 31) = 36.28$, $p < .001$, $\eta^2 = .54$. A significant main effect of choice option was found such that participants reported feeling more negatively about the sure option ($M = 3.43$, $SD = .56$), than the gamble option ($M = 3.82$, $SD = .66$), $F(1, 31) = 7.71$, $p < .01$, $\eta^2 = .20$. Lastly, a significant Frame \times Option interaction was found, $F(1, 31) = 39.90$, $p < .001$, $\eta^2 = .56$. Follow-up paired-samples t tests examined how feelings toward the choice options differed across the frames. The first test examined if feelings toward the sure option were different for gain and loss frames. Participants reported feeling more negatively toward the sure option in the loss frame ($M = 2.92$, $SD = .55$) than in the gain frame ($M = 3.94$, $SD = .84$), $t(31) = -6.68$, $p < .001$. The next test examined if feelings toward the gamble option were different between the gain and loss frames. No significant difference was found for participants' feelings toward the gamble option between the gain ($M = 3.83$, $SD = .84$) and loss frame ($M = 3.81$, $SD = .55$), $t(31) = .32$, $p = .75$. These results indicate that feelings toward the sure—but not gamble—options were significantly different between the framing conditions (Figure 1).

The explanatory role of immediate affect in the risky choice framing effect. Using the method outlined by Hayes (2009), a mediation analysis was conducted to examine whether immediate feelings toward the sure choice option could explain or partially explain the influence of framing on risk taking in the gambling task. Utilizing the mediation package (Tingley, Yamamoto, Hirose, Keele, & Imai, 2014) in R (R Core Team, 2013), the estimate

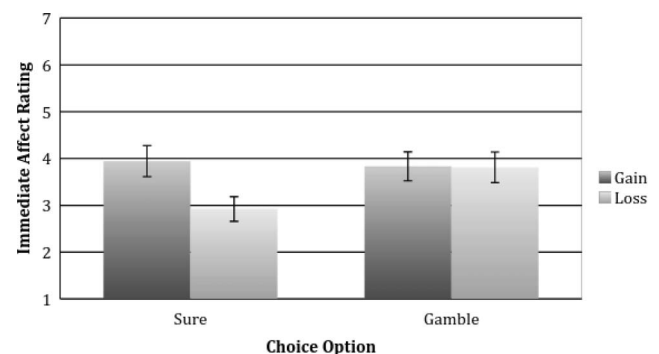


Figure 1. The effect of gain and loss frame conditions on immediate affect toward the sure and gamble options.

for the causal mediation effect (indirect effect; IE) and the direct effect (DE) was computed for each of 5,000 bootstrapped samples, and the 95% confidence interval (CI) was computed by determining the IEs and DEs at the 2.5th and 97.5th percentiles. The analysis indicated that the relationship between framing and risk-taking behavior in the gambling task was partially explained by immediate feelings toward the sure choice option (IE: $\beta = -.081$, 95% CI $[-.098, -.066]$, $p < .01$; DE: $\beta = -.078$, 95% CI $[-.120, -.040]$, $p < .01$). Compared with the loss frame, the gain frame was associated with fewer gambling choices as mediated by immediate affect toward the sure choice option. Immediate feelings toward the gamble option were not examined as a potential mediator as this variable was not influenced by the framing condition.

Discussion

Building upon Cheung and Mikels (2011) and Stark and colleagues (2017), Experiment 1 was designed to determine whether framing influences immediate affect toward the sure and gamble options and whether frame-dependent feelings could explain increased risk taking in loss (relative to gain) frames within a risky choice framing context. Previous studies examined the influence of framing on integral feelings related to the decision overall (Cheung & Mikels, 2011) and toward each choice option (Stark et al., 2017). The present experiment examined immediate affective responses to each decision option to determine the precise way in which affect may guide decision making in risky choice framing tasks.

Our results demonstrated that framing influences immediate feelings toward the sure option and not the gamble option. This finding is in line with our predictions, as well as those made by Kahneman and Frederick (2007). Specifically, participants reported feeling more negatively about the sure option when it was framed as a loss rather than a gain. Most importantly, the results also indicate that immediate feelings toward the sure, and not the gamble, option explained the effect of framing on gambling behavior in the task. Specifically, immediate feelings toward the sure option partially mediated the effect of frame on risk-taking behavior. Thus, we demonstrated that in risky choice framing, participants' greater likelihood of choosing the gamble option when the sure option is presented as a loss results from the relatively more negative feelings toward the sure option in the loss frame in comparison with the gain frame.

In a previous study using the same gambling paradigm as the present experiment, positive integral affect was related to increased risk taking in loss frames (Cheung & Mikels, 2011). Interestingly, the present experiment suggests that framing had no effect on integral feelings toward the uncertain, risky option. Considering these previous findings with the present results reveals that integral feelings toward an entire decision are considerably different than integral feelings toward separate choice options. When asked to consider the decision itself, positive integral feelings predicted risk taking (Cheung & Mikels, 2011). Conversely, when integral feelings were focused on individual options, negative integral feelings (toward the sure loss) predicted increased risk taking. Thus, it is possible that the integral affect probe in Cheung and Mikels (2011) was not assessing feelings toward only the gamble option. Instead, the affect probe may have

captured an overall positive gestalt rating that considered feelings toward the sure and gamble options together. In line with this explanation, the present study found that the gamble option was indeed rated more positively than the sure option, especially in the loss frame.

This study also partially replicates the pattern of results in past research examining the role of immediate affect in risky choice framing (Stark et al., 2017). Stark and colleagues (2017) found that framing changed immediate affect toward both the sure and the gamble choice option and that the immediate affective evaluations explained the effect of frame on choice. In the present study, we found that framing influenced immediate affect toward the sure choice option, but not the gamble choice option. The pattern of results for the gamble choice option could be different as the studies were methodologically different. For instance, the choice contexts were different. Stark and colleagues (2017) used four abstract scenarios involving a choice between plans allowing a certain number of people to be saved or die (Tversky & Kahneman, 1981). In comparison, the present study used a more realistic and self-relevant task that presented participants with 96 monetary decisions (De Martino et al., 2006). Additionally, the rating scales of the experiments were different. Stark and colleagues (2017) used a unipolar scale that only measured positive affect (i.e., from *not at all appealing* to *very appealing*), whereas the present study used a bipolar scale that spanned from negative to positive affect (i.e., *very negative* to *very positive*). The rating scales do not capture affect in the same way; the scale used by Stark and colleagues (2017) does not capture negative affect. For these reasons, it is likely that participants in the studies responded somewhat differently, which, in turn, could have led to the slightly different pattern of results for the gamble option. Most importantly, though, both studies found that immediate affective evaluation of the sure choice option mediated the effect of frame on choice. This consistent finding across both studies provides support for Kahneman and Frederick's (2007) assertion that framing is more strongly driven by the sure option.

Despite the important role of immediate affect in framing as found in Experiment 1, is it also possible that anticipated affect plays a role? No study to date has examined anticipated feelings within risky choice framing. Considering that anticipated affect has been shown to play a role in risky decision making broadly (Chen & Ma, 2009; Denburg et al., 2006; Mellers, 2000; Mellers & McGraw, 2001; Schlösser et al., 2013), it is important to consider immediate and anticipated affect together to gain a complete understanding of the role of integral affect in risky choice framing. To test this possibility, Experiment 2 was designed to compare which form of integral affect, anticipated or immediate, could better explain the risky choice framing effect.

Experiment 2: Contrasting the Influence of Immediate and Anticipated Affect in the Risky Choice Framing Effect

Previous research has found that both immediate affect and anticipated affect predict risky decision making (Chen & Ma, 2009; Mellers, 2000; Mellers & McGraw, 2001; Schlösser et al., 2013). The present study sought to extend the comparison of immediate and anticipated affect to risky choice framing and examined whether the effects of framing on risk taking could be

explained by immediate and/or anticipatory affect toward choice options. Thus, the present study included affect probes assessing participants' immediate and anticipated feelings toward each option in the gain and loss frames. Based on the findings of Experiment 1 we predicted that framing would only influence immediate and anticipated feelings toward the sure option and not the gamble option. Furthermore, based on the findings of Schlösser and colleagues (2013), we predicted that immediate affect would better explain the effect of framing on risk taking relative to anticipated affect.

Method

Participants. DePaul University undergraduates ($N = 24$; 16 women and 8 men) ranging in age from 18 to 24 ($M = 19.75$, $SD = 1.57$) participated for course credit. This experiment was approved by the DePaul University Institutional Review Board (JM050415PSY).

Materials and procedure. The method and procedure for Experiment 2 were different from Experiment 1 in a few ways. Participants completed only 32 gamble trials; 16 gain and 16 loss trials. Prior to making their choice, participants were presented with six probes (using the same scale as in Experiment 1). Two of the probes were identical to those used in Experiment 1 ("How do you feel about the option on the left/right?"), the other four probes measured participants' anticipated affect toward each option given hypothetical scenarios in which the gamble either wins or loses. The first two probes concerned anticipated affect toward the sure option: "If you choose the sure option and the gamble option wins (loses), how would you feel?" The next two probes concerned anticipated affect toward the gamble option: "If you choose the gamble option and the gamble option wins (loses), how would you feel?" The order of the immediate affect and anticipated affect probes were counterbalanced across participants. Half of the participants completed the immediate affect probes prior to the anticipated affect probes, whereas the other half of the participants completed the anticipated probes first.

Results

A series of analyses examined if there was an effect of gain versus loss framing on gambling behavior and integral affective evaluations (immediate and anticipated) of the sure and gamble options. Also, we examined whether evaluations of immediate and anticipated affect could explain the effect of frame on risk-taking behavior in the task. All analyses were conducted with and without controlling for state affect, which did not impact any the pattern of results. Therefore, the analyses are reported without controlling for state affect.

The effect of frame on gambling behavior. A one-way repeated-measures ANOVA was conducted to examine if there were differences in risk taking between the gain and loss frames. The dependent variable in the analysis was the proportion of trials in which participants selected the gamble option. Results indicated that participants were more likely to choose the gamble option in the loss frame ($M = .64$, $SD = .19$), than in the gain frame ($M = .49$, $SD = .17$), $F(1, 23) = 14.28$, $p < .001$, $\eta^2 = .383$.

The effect of frame on immediate feelings toward sure and gamble options. A 2×2 repeated-measures ANOVA was conducted to examine the effects of the within-participant framing

manipulation (gain vs. loss) on participants' immediate feelings regarding the choice options (sure vs. gamble) that were reported prior to their decision. A significant main effect of the framing condition was found such that participants reported feeling more negatively about the options in the loss frame ($M = 3.58$, $SD = .56$) compared with the gain frame ($M = 4.24$, $SD = .45$), $F(1, 23) = 23.80$, $p < .001$, $\eta^2 = .509$. There was no main effect of choice option, such that participants did not report feeling differently about the gamble option ($M = 3.98$, $SD = .64$) compared with the sure option ($M = 3.84$, $SD = .53$), $F(1, 23) = .54$, $p = .470$, $\eta^2 = .023$. Lastly, a significant Frame \times Option interaction was found, $F(1, 23) = 10.73$, $p = .003$, $\eta^2 = .318$.

Follow-up paired-samples t tests were conducted to examine how the feelings toward the choice options changed across the frames. The first test examined if feelings toward the sure option were different between the gain and loss frames. Participants reported feeling more negatively toward the sure option in the loss frame ($M = 3.26$, $SD = .76$) than the gain frame ($M = 4.42$, $SD = .89$) $t(23) = -4.45$, $p < .001$. The next test examined if feelings toward the gamble option were different between the gain and loss frames. No significant difference was found in participants' feelings toward the gamble option between the gain ($M = 4.06$, $SD = .69$) and loss frame ($M = 3.90$, $SD = .74$), $t(23) = 1.29$, $p = .21$. Replicating the results from Experiment 1, these results show that feelings toward the sure—but not gamble—options changed as a function of frame.

The effect of frame on anticipated feelings toward sure and gamble options. A $2 \times 2 \times 2$ repeated-measures ANCOVA was conducted to examine the effects of the within-participant framing manipulation (gain vs. loss) on participants' anticipated feelings regarding the choice options (sure vs. gamble) depending on the hypothetical outcome of the choice (whether the gamble option won or lost). A significant main effect of the framing condition was found such that participants reported feeling more positive anticipated affect about the options in the gain frame ($M = 4.20$, $SD = .24$) compared with the loss frame ($M = 4.05$, $SD = .27$), $F(1, 23) = 7.75$, $p = .011$, $\eta^2 = .252$. There was also a main effect of choice option, such that participants reported feeling more positively about the gamble option ($M = 4.32$, $SD = .32$) than the sure option ($M = 3.93$, $SD = .29$), $F(1, 23) = 19.19$, $p < .001$, $\eta^2 = .455$. Additionally, a main effect of the hypothetical outcome emerged such that participants had more positive anticipated affect toward choice options when considering how they would feel about the options when the gamble option won ($M = 4.57$, $SD = .43$) rather than lost ($M = 3.68$, $SD = .50$), $F(1, 23) = 27.55$, $p < .001$, $\eta^2 = .545$.

The Frame \times Option interaction was not significant, $F(1, 23) = 2.87$, $p = .104$, $\eta^2 = .111$, suggesting that participants' anticipated feelings toward the sure and gamble options did not differ across frames. Similarly, the Frame \times Outcome interaction was not significant, $F(1, 23) = 1.72$, $p = .203$, $\eta^2 = .070$, suggesting that participants anticipated feelings toward the sure and gamble options did not differ across frames. A significant interaction was found between the choice option and the hypothetical choice outcome on participants' anticipated affect, $F(1, 23) = 77.50$, $p < .001$, $\eta^2 = .771$.

Follow-up paired-samples t tests were conducted to examine how the feelings toward the choice options changed across the hypothetical outcomes. The first test examined if feelings toward

the sure option were different when participants were asked to answer based on how they would feel if the gamble option won versus lost. Participants reported feeling more positively toward the sure option if the gamble option were to result in a loss ($M = 5.01$, $SD = 1.19$) rather than if it were to result in a win ($M = 2.89$, $SD = 1.00$), $t(22) = -4.79$, $p < .001$. The next test examined if feelings toward the gamble option were different depending on whether participants were asked to answer based on how they would feel if the gamble option won versus lost. Participants reported feeling more positively toward the gamble option if the gamble option were to result in a win ($M = 6.26$, $SD = .80$) rather than if it were to result in a loss ($M = 2.35$, $SD = .92$), $t(22) = 11.69$, $p < .001$.

Lastly, a marginally significant three-way Frame \times Option \times Outcome interaction emerged, $F(1, 23) = 3.75$, $p = .065$, $\eta^2 = .140$. To explore the nature of this interaction, two separate repeated-measures ANOVAs, one for each hypothetical outcome of the gamble, were conducted to examine the interactions between frame and choice option on anticipated affect. The first ANOVA examined anticipated affect as a function of frame and choice option if the gamble option were to result in a win. The effect of frame was significant, $F(1, 23) = 9.58$, $p = .005$, $\eta^2 = .294$, such that participants reported feeling more positive anticipated affect in the gain frame ($M = 4.56$, $SD = .43$) than in the loss frame ($M = 4.45$, $SD = .37$). Next, a significant main effect of option emerged, $F(1, 23) = 111.64$, $p < .001$, $\eta^2 = .829$, such that participants felt more positive anticipated affect about the gamble option ($M = 6.25$, $SD = .79$) than the sure option ($M = 2.89$, $SD = .98$). Lastly, a significant Frame \times Option interaction emerged, $F(1, 23) = 7.43$, $p = .012$, $\eta^2 = .244$. Follow-up paired-samples t tests indicated that in the case of the gamble option winning, participants would feel more positively about the sure option in the gain frame ($M = 3.10$, $SD = 1.13$) than in the loss frame ($M = 2.68$, $SD = .95$), $t(22) = 3.40$, $p = .003$. Frame had no effect on feelings toward the gamble option such that participants did not report that they would feel any differently about the gamble option in the gain frame ($M = 6.28$, $SD = .82$) than in the loss frame ($M = 6.25$, $SD = .82$), $t(22) = .50$, $p = .62$ (Figure 2).

The second ANOVA examined anticipated affect as a function of frame and choice option if the gamble option lost. The effect of

frame was not significant, $F(1, 23) = 1.02$, $p = .32$, $\eta^2 = .042$, such that participants did not report any differences in anticipated affect between the gain frame ($M = 3.72$, $SD = .56$) and the loss frame ($M = 3.64$, $SD = .51$). Next, a significant main effect of option emerged, $F(1, 23) = 47.02$, $p < .001$, $\eta^2 = .67$, such that participants felt more positive anticipated affect about the sure option ($M = 4.98$, $SD = 1.17$) than the gamble option ($M = 2.38$, $SD = .92$). Lastly, the Frame \times Option interaction was not significant, $F(1, 23) = .25$, $p = .62$, $\eta^2 = .011$.

The roles of immediate and anticipated affect in the risky choice framing effect. The previous analyses demonstrated that framing only influenced immediate feelings regarding the sure option and anticipated feeling toward the sure option if the gamble option were to result in a win. Therefore, we only examined the mediating influence of these two variables (immediate feelings toward the sure option and anticipated feeling toward the sure option if the gamble option were to result in a win). Using the method outlined by Hayes (2009), two mediation analyses were conducted. The first examined if immediate feelings toward the sure choice option could explain or partially explain the influence of framing on risk taking controlling for anticipated affect toward the sure option if the gamble were to win. The second examined if anticipated feelings toward the sure option if the gamble were to win could explain or partially explain the influence of framing on risk taking controlling for immediate affect toward the sure option. Utilizing the mediation package (Tingley et al., 2014) in R (R Core Team, 2013), these mediation analyses were conducted to obtain the IE and DE as described in Experiment 1.

The analysis examining immediate affect toward the sure option showed that the relationship between framing and risk-taking behavior in the gambling task was partially explained by immediate feelings toward the sure choice option (IE: $\beta = -.058$, 95% CI $[-.083, -.036]$, $p < .01$; DE: $\beta = -.070$, 95% CI $[-.138, -.003]$, $p = .04$). Compared with the loss frame, the gain frame was associated with fewer gambling choices as mediated by immediate affect toward the sure option.

The analysis examining anticipated affect toward the sure option if the gamble were to win showed that the relationship between framing and risk taking in the gambling task was not explained by the anticipated affect toward the sure option if the gamble were to win (IE: $\beta = -.0009$, 95% CI $[-.006, .003]$, $p = .63$; DE: $\beta = -.070$, 95% CI $[-.014, -.003]$, $p = .04$).

Discussion

To extend work examining integral affect in risky decision making (Schlösser et al., 2013), the present study was designed to examine whether immediate and/or anticipated feelings toward sure and gamble options could explain the effect of framing in a risky choice framing task. Replicating the findings of Experiment 1, and Stark and colleagues (2017), framing influenced integral feelings toward the sure option. Participants felt more negatively toward the sure option in the loss frame as compared with the gain frame. Regarding anticipated affect, participants reported that they would feel more negatively toward the sure option in the loss frame than in the gain frame if the gamble were to win. Framing had no effect on anticipated feeling toward choosing the sure option when the gamble was to hypothetically lose. This pattern underscores the greater affective impact of losses relative to gains;

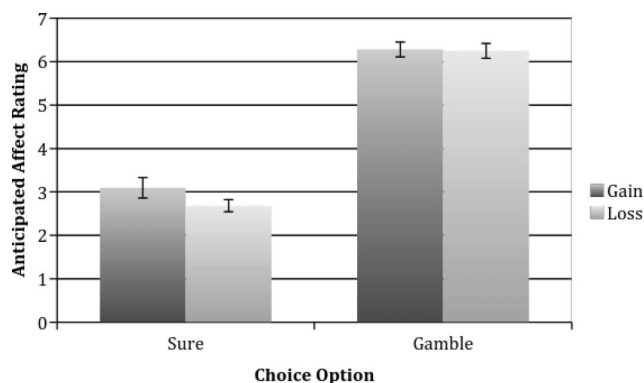


Figure 2. The effect of gain and loss framing on anticipated affect toward sure and gamble options if the gamble were to win.

when the outcome of the gamble is certain, framing only impacts anticipated affect when predicting feelings that result from non-optimal choices (missing a winning gamble).

Furthermore, replicating the results of Experiment 1 and partially replicating the work of Stark and colleagues (2017), immediate affect toward the sure options partially mediated the effect of framing on risk-taking behavior. However, anticipated affect toward the sure option if the gamble were to win did not mediate the effect of framing on risk-taking behavior. Therefore, immediate, but not anticipated feelings, toward the sure option can partially explain the pattern of loss-averse behavior in the risky choice framing paradigm.

General Discussion

Previous research suggests that affect plays an important role in the framing effect (e.g., Cheung & Mikels, 2011; De Martino et al., 2006; Stark et al., 2017). The present experiments sought to provide a more thorough understanding of the role of integral affect in risky choice framing, similar to Schlösser and colleagues (2013). Specifically, we examined whether integral affect toward specific choice options could explain why individuals exhibit loss aversion (more risk taking when faced with sure losses as opposed to sure gains) in the risky choice framing paradigm. Results of Experiments 1 and 2 suggest that framing influences risk-taking behavior within risky choice framing, in part, through immediate, but not anticipated, integral feelings toward the sure option. In other words, framing sure options as losses increased risk taking partially due to the greater negative immediate feelings that were evoked by sure losses relative to sure gain. Overall, these data suggest that the effect of integral affect on risky choice framing is explained by immediate feelings an individual has toward the sure choice option, and not what they anticipate feeling as a result from their choice.

Moreover, converging results from both experiments strongly suggest that regarding the role of framing on integral affect, it is truly all about the sure option. Specifically, Experiment 1 demonstrated that framing influenced immediate feelings toward the sure option yet did not change how participants felt about the gamble option. Experiment 2 demonstrated that framing influenced both immediate affect and anticipated affect toward the sure option if the gamble option were to win. Most importantly, the findings of Experiment 2 contrasted the influences of immediate and anticipated affect in the risky choice framing effect. Although framing did change both immediate and anticipated affect, the findings suggest that the risky choice framing effect is only explained by immediate and not anticipated affect. Thus, evidence from these studies suggest that framing guides risk taking by altering immediate, rather than anticipated, affective pathways.

Although the results of these studies make a compelling case for the specific role of integral affect in the framing effect, there are limitations. For instance, we examined the role of integral affect in frame-dependent risk taking using only one type of risky choice framing task. Future research could address this by measuring both immediate and anticipated affective evaluations of choice options in other risky choice paradigms, such as the Asian disease problem (Tversky & Kahneman, 1981). Moreover, our experiments relied on subjective evaluations of integral affect. Future research should strive to link self-reported integral affect in the context of risky

choice framing with more objective affective measures such as autonomic arousal (e.g., Ring, 2015).

To expand upon the present study, future research could consider comparing the role of immediate and anticipated affect in more applied decision contexts. For example, research focused on improving decision making related to health behaviors could consider examining the role of immediate and anticipated affect within health message framing (Mikels et al., 2016; Rothman & Salovey, 1997). It is possible that health message framing, which influences health behaviors, also could be explained by immediate and not anticipated affect. Furthermore, given that older adults are less impacted by negative health information relative to younger adults, it would be useful to investigate if this difference is the result of immediate and/or anticipated affect (Carstensen & Mikels, 2005; Mikels et al., 2016).

Overall, the findings of the present experiments illuminate the affective mechanisms that guide loss-averse risk-taking behavior in a risky choice framing task, a widely replicated and influential decision-making paradigm. Our findings suggest that loss aversion in the context of the risky choice framing is at least partly guided by immediate feelings, but not anticipated feelings, toward the sure options and that framing has no effect on integral feelings toward an uncertain gamble option. Specifically, we found that individuals tend to be more risk taking when faced with sure losses as opposed to sure gains due to the greater negative immediate feelings that are evoked by sure losses relative to sure gains. These findings are not only useful for understanding the theoretical role of affect in decision biases but can also be influential in guiding decision interventions aimed at reducing the perceived emotional impact of sure losses to promote better decision making.

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