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Risky-choice framing and its null effect on integral emotions

Hao Cheng[a], Calvin Burns[b] and Matthew Revie[a]

[a]Strathclyde Business School, University of Strathclyde, Glasgow, UK; [b]School of Human Sciences, University of Greenwich, London, UK

ABSTRACT

The effects of risky-choice framing are well-established and have been demonstrated in several decision contexts. Recent research has pointed to a role for affect and emotions in risky-choice framing, but those findings may have been influenced by carry-over effects due to the use of multiple decision problems. In a one-off decision, the effects of risky-choice framing on affect and emotions remain unclear. This article extends the risky-choice framing literature by using the Emotion-Imbued Choice model to investigate whether integral fear and anger can account for the effects of risky-choice framing in a one-off decision. In two studies involving a one-off decision about internet connectivity and human lives respectively, we expected higher levels of integral fear in participants who chose the certain option in the positive framing condition as compared to the negative framing condition, and also higher levels of integral anger in participants who chose the risky option in the negative framing condition as compared to the positive framing condition. Our findings did not support these hypotheses and suggest that the effects of risky-choice framing are not due to integral emotions. We explained our findings by proposing that the choice architecture involved in risky-choice framing prevents integral emotions from becoming attached to the choice options because it offers a less effortful decision tactic than considering one's emotional response to those options. We call for future research to investigate this possibility and to also consider the demand characteristics of conducting risky-choice framing problems online.

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Risky-choice framing; integral emotions; emotion-imbued choice model; Internet connection decision problem; Asian disease problem

1. Introduction

Affect is an important part in how people perceive risk and make risk-related decisions. The Affect Heuristic (Alhakami and Slovic 1994) and the Risk-as-Feelings Hypothesis (Loewenstein et al. 2001) propose that generalized positive or negative feelings (i.e. positive or negative affect) develop during the decision-making process and influence people's choices. These frameworks have been very influential but more recently, Lerner et al. (2015) proposed the emotion-imbued choice (EIC) model to explain the role of specific emotions in a one-time choice between given options. The EIC model offers the potential for new insights into the role of emotions in many types of risk-related decisions.

CONTACT Calvin Burns c.burns@gre.ac.uk School of Human Sciences, University of Greenwich, Dreadnought Building, Room 150, Old Royal Naval College, Park Row, London SE10 9LS, UK

One area in which the EIC model can be used to better understand the role of emotions in decision-making is risky-choice framing. The risky-choice framing effect is the tendency for people to choose a risky option instead of a certain option when the choices are framed negatively (e.g. as a loss, or deaths), and vice versa when the choices are framed positively (e.g. as a gain, or lives saved) (Tversky and Kahneman 1981). Many cognitive explanations for the effects of risky-choice framing have been proposed (for a review see Kahneman and Tversky 2000). More recently, researchers have started to investigate the role of affect and emotion in risky-choice framing (e.g. Druckman and McDermott 2008; Stark et al. 2017) but their role in a one-off decision remains unclear. The aim of this article is to extend the literature by using the EIC model to investigate whether integral emotions (i.e. emotions induced from the decision problem and felt at the time of the decision) can account for the effects of risky-choice framing in a one-off decision. Using two different contexts for a decision problem, we investigate whether integral fear could account for the preference for the certain option in positive framing compared to negative framing, and whether integral anger could account for the preference for the risky option in negative framing compared to positive framing.

1.1. Previous research on the role of integral affect and emotions in Risky-Choice framing

The effects of risky-choice framing have been replicated in a range of contexts (for a review see Pinon and Gambara 2005). An influential cognitive explanation of these effects is that framing manipulates the salience or accessibility of different types of information which induces people to think in terms of losses or gains, subsequently influencing their choice preferences (Jou, Shanteau, and Harris 1996). Research along these lines has continued and Yechiam et al. (2015) found evidence to suggest that losses have a greater effect on attentional processes than affective reactions. Tversky and Kahneman (1981) argued though that choice between gains or losses of different amounts reflect how an individual feels about those choices (e.g. a loss feels worse than an equivalent gain feels good). DeMartino et al. (2006) found increased amygdala (the area of the brain most associated with emotional processing) activity in participants who made choices consistent with the framing effect, which suggests a role for emotions. Researchers have started to investigate the role of affect and emotions in risky-choice framing, but existing research has not investigated integral affect or indeed specific integral emotions in a one-off decision.

Stark et al. (2017) investigated the effects of risky-choice framing on affect but collapsed their findings across a series of decision problems. Participants were randomly assigned to a framing condition and completed three life or death decision problems in succession. In each problem, they rated their mood levels for the certain and risky options using an affect grid (Russell, Weiss, and Mendelsohn 1989) before indicating their choice preference. By collapsing their findings across the three decision problems, Stark et al. (2017) found that positively framed options (i.e. lives saved) elicited a more positive mood than negatively framed options (i.e. deaths). This effect was qualified by a frame by choice interaction such that the certain option (i.e. a given number of lives saved) elicited a modestly more positive mood in the positive framing condition than did the certain option in the negative framing condition (i.e. a given number of deaths). As Stark et al. (2017) collapsed their findings across the three decision problems, it is unclear what participants' mood levels were like for any one decision, and their results may have been influenced by carry-over effects or incidental influences from one decision problem to the next.

Druckman and McDermott (2008) investigated the role of discrete emotions in risky-choice framing but did not measure emotions felt at the time of decision. Participants were randomly assigned to a framing condition and completed four randomly ordered decision problems.

Participants then completed the Positive and Negative Affect Scale (Watson, Clark, and Tellegen 1988) in which they were asked "To what extent do you feel [*emotion*] right now, at this present moment?". Druckman and McDermott (2008) found that for one of the four problems, the Asian disease problem (Tversky and Kahneman 1981), higher levels of anger were associated with a greater preference for the risky option, and higher levels of distress were associated with a greater preference for the certain option. Although they did not report the effect of framing condition on emotions, they found that for positive framing, feeling more distress increased the probability of choosing the certain option. Their results however, like those of Stark et al. (2017), may have been influenced by carry-over effects or incidental influences from one decision problem to the next. The literature thus remains unclear about the role of integral affect and emotions in a one-off decision involving risky-choice framing.

1.2. The EIC model and risky-choice framing

In order to better understand risky-choice framing, we set out to investigate specific emotions as opposed to affect, because fear and anger, which are both part of negative affect, can lead to different choice behavior. Lerner et al. (2003) argued that fear may result from appraisals of uncertainty and situational control, and lead to risk-averse choices, and that anger may result from appraisals of certainty and individual control, and lead to risk-seeking choices. Druckman and McDermott (2008) findings from the Asian disease problem that higher levels of distress were associated with a greater preference for the certain option, and that higher levels of anger were associated with a greater preference for the risky option, are consistent with this notion. It follows that in a one-off decision, the preference for the certain option in positive framing as compared to negative framing may arise from/evoke fear, and that the preference for the risky option in negative framing as compared to positive framing may arise from/evoke anger. We aimed to investigate these possibilities using the EIC model.

Lerner et al. (2015) proposed the EIC model to explain the role of specific emotions in a one-time choice between given options. The EIC model is ideal for investigating the role of integral emotions in a one-off decision involving risky-choice framing as it proposes that the 'characteristics of options' (i.e. certain and risky choice options framed positively and negatively) will influence 'current emotions', which are the emotions felt at the time of a one-off decision. We classify such 'current emotions' as integral emotions because they are induced from the characteristics of the choice options and felt at the time of a one-off decision; they are distinct from incidental emotions which may arise from 'incidental influences' or sources not relevant to the one-off decision. The EIC model thus explains risky-choice framing by integral emotions (i.e. 'current emotions' induced by the 'characteristics of options') reciprocally influencing 'conscious and/or nonconscious evaluation' leading in turn to a 'decision' or choice preference. Certainly, the EIC model offers the potential to better understand risky-choice framing by considering the role of specific integral emotions in a one-off decision.

1.3. Research aim

The aim of this article is to extend the literature on risky-choice framing by using the EIC model to investigate the role of specific integral emotions in a one-off decision. Given the extant literature, we expect to find higher levels of integral fear in participants who chose the certain option in the positive framing condition as compared to the negative framing condition. We also expect to find higher levels of integral anger in participants who chose the risky option in the negative framing condition as compared to the positive framing condition. We test our expectations in two studies using different contexts for decision problems.

2. Study 1

The purpose of this study was to investigate the roles of integral fear and anger in a risky-choice framing decision problem about Internet connectivity. This is a relevant context for investigation as people today make decisions frequently using online technology and about Internet connectivity (Bott, Montagno, and Lane 2010; Darley, Blankson, and Luethge 2010; Pew Research Center 2019). We are also not aware of any previous risky-choice framing studies about the Internet. Our hypotheses were as follows.

Hypothesis 1: People will prefer the certain instead of risky option when the options are framed positively (i.e. in terms of a reliable connection), and people will prefer the risky instead of certain option when the options are framed negatively (i.e. in terms of an unstable connection). In other words, we expected to find the well-established effects of risky-choice framing. .

Hypothesis 2: Integral fear will lead to a preference for the certain option in positive framing compared to negative framing.

Hypothesis 3: Integral anger will lead to a preference for the risky option in negative framing compared to positive framing.

2.1. Method

2.1.1. Participants

One hundred thirteen undergraduate business/management students from the UK University participated in this study. They took part voluntarily and received class credit for participating. Their mean age was 19.89 years (SD = 3.15 years) with ages ranging from 18 to 44 years. There were 22 male participants (20%) and 91 female participants (80%). Participants were assigned randomly to one of the two experimental conditions (54 in the positive framing condition and 59 in the negative framing condition).

2.1.2. Procedure

This study was conducted online using Qualtrics, an online survey platform. Participants were randomly assigned to a positive or negative framing condition. They were then e-mailed one of two links to the study depending on the framing condition to which they had been assigned. They were instructed to complete the study when they were alone in a quiet location. After reading information about the study and how their data would be used, participants answered questions about their age and gender. They were then presented with the Internet Connection decision problem and asked to choose one of two options. Finally, participants were asked to rate the extent to which they felt 16 different emotions during the decision-making task. Stark et al. (2017) acknowledged that they may have biased their participants by asking them to rate their moods for the certain and risky options before indicating their choice preference. To prevent such bias, we required our participants to complete these ratings immediately after indicating their choice preference by instructing them to 'Please indicate the greatest amount of each emotion you felt at any time when choosing your preferred program.' On average, participants took 5.5 minutes to complete the study. This study was approved by a university Research Ethics Committee.

2.1.3. Materials

We developed a decision problem about the reliability of home internet connections because there are very few if any studies about information framing in this context, and because people are increasingly have to make frequent decisions about internet connectivity. The Internet Connection decision problem is shown in Table 1. All the information for each condition (i.e. positive or negative framing with certain and risky choice options) was presented on a single

Table 1. Internet connection decision problem with positively and negatively framed options.

Scenario			
You want to purchase broadband for a home Internet connection. You have a choice of two Internet Service Providers (ISP A and ISP B).			
Positive framing condition		Negative framing condition	
Certain option	Risky option	Certain option	Risky option
ISP A: Out of 100 customers, 80 customers will have a reliable home Internet connection	ISP B: There is 4/5 probability that 100 customers will have a reliable home Internet connection, and a 1/5 probability that no customers will have a reliable home Internet connection	ISP A: Out of 100 customers, 20 customers will have an unstable home Internet connection	ISP B: There is 4/5 probability that no customers will have an unstable home Internet connection, and 1/5 probability that 100 customers will have an unstable home Internet connection

Table 2. Observed choice preferences by framing condition.

	Choice		
Framing	Certain	Risky	Total
Positive	32 (59%)	22 (41%)	54
Negative	23 (39%)	36 (61%)	59

screen. Participants were asked 'Based on this information, which ISP would you choose for your home Internet connection?'.

The Internet Connection decision problem is similar in structure to Tversky and Kahneman (1981) Asian disease problem; information was framed either positively or negatively and within each framing condition, participants were presented with a certain and risky choice option. In our positive framing condition, participants were presented with information about a 'reliable' internet connection instead of information that 'people will be saved', and in our negative framing condition, participants were presented with information about an 'unstable' internet connection instead of information that 'people will die'. Like the Asian disease problem, the choice options within our framing conditions had the same expected values but one choice gave a certain outcome (i.e. a specified number of customers with reliable/unstable internet connection) and the other gave a risky outcome (i.e. the probability that customers will have a reliable/unstable internet connection or not). The options between framing conditions were also equivalent (e.g. out of 100 customers, 80 customers will have a reliable home Internet connection for the positive framing condition, which means that in the negative framing condition 20 customers will have an unstable home Internet connection).

Immediately after the decision task, participants completed a commonly used emotion self-report form (Goldberg, Lerner, and Tetlock 1999; Gross and Levenson 1995; Lerner and Keltner 2001). The instructions and a list of 16 emotions were presented on a single screen. Participants were instructed to 'Please indicate the greatest amount of each emotion you felt at any time when choosing your preferred program.' They responded on a seven-point scale with anchors of 'Did not feel the slightest bit' and 'Most I have ever felt in my life'. The 16 emotions were listed alphabetically on the form as follows: amused, angry, anxious, disgusted, downhearted, engaged, fearful, frustrated, happy, joyful, interested, irritated, mad, nervous, repulsed, and sad.

2.2. Results

2.2.1. Risky-choice framing

Table 2 shows the number and percentage of participants in each framing condition by choice preference. In the positive framing condition, most participants chose the certain option over

Table 3. Mean emotion ratings (standard deviation) by framing condition and choice.

	Positive framing		Negative framing	
Emotion	Certain outcome	Risky outcome	Certain outcome	Risky outcome
Amused	2.03 (1.23)	2.05 (1.17)	1.83 (1.07)	2.00 (1.45)
Angry	1.84 (1.30)	2.18 (1.68)	1.70 (1.06)	1.67 (0.93)
Anxious	2.63 (1.54)	2.64 (1.65)	2.35 (1.34)	2.44 (1.66)
Disgusted	1.47 (0.92)	1.73 (1.42)	1.17 (0.49)	1.36 (0.80)
Downhearted	1.63 (0.91)	1.77 (1.41)	1.57 (1.24)	1.56 (0.84)
Engaged	3.78 (1.58)	4.09 (1.23)	3.96 (1.49)	3.22 (1.49)
Fearful	2.13 (1.34)	2.14 (1.46)	1.65 (1.27)	2.19 (1.45)
Frustrated	3.00 (1.93)	2.68 (1.94)	2.57 (1.53)	2.72 (1.56)
Happy	2.38 (1.36)	2.36 (1.43)	2.13 (1.33)	2.06 (1.41)
Joyful	1.84 (1.05)	2.00 (1.45)	1.87 (1.18)	1.75 (1.34)
Interested	3.72 (1.55)	3.64 (1.53)	3.65 (1.67)	3.94 (1.26)
Irritated	3.06 (2.03)	2.91 (2.02)	2.91 (1.81)	2.47 (1.58)
Mad	2.16 (1.65)	2.27 (1.67)	1.87 (1.18)	1.69 (1.01)
Nervous	2.69 (1.79)	2.50 (1.71)	2.04 (1.22)	2.56 (1.59)
Repulsed	1.34 (0.94)	1.59 (1.40)	1.26 (0.86)	1.28 (0.57)
Sad	1.38 (0.66)	1.36 (1.33)	1.17 (0.49)	1.36 (0.99)

the risky option (i.e. 59% vs. 41%). In the negative framing condition, most participants chose the risky option over the certain option (i.e. 61% vs. 39%).

A z-test for two sample proportions was conducted to determine if there were any significant differences in choice preference depending on framing condition. The results were significant; $z = 2.1$, $p = .034$, two-tailed. Thus, the effects of risky-choice framing were observed for the Internet Connection decision problem; people preferred the certain option when information was framed positively (i.e. a reliable internet connection) but preferred the risky option when information was framed negatively (i.e. an unstable internet connection). Further analyses revealed that the effects of risky-choice framing could not be attributed to gender or age.[1] These findings support Hypothesis 1.

2.2.2. Integral emotions and integral affect

Table 3 shows the mean rating for each emotion by framing condition and choice. The intensities for all the emotions were low; the ratings were made on a seven-point scale with higher scores representing greater intensities.

To test Hypotheses 2 and 3, we created composite scores for fear and anger as per Lerner and Keltner (2001, Study 4, p. 153). These scores are shown in Table 4.

A 2 * 2 ANOVA was conducted to determine whether there were any differences in the Fear score due to framing condition and choice preference. The ANOVA did not find any significant effect of framing condition, $F(1,109) = .92$, $p = .34$, or choice preference, $F(1,109) = .42$, $p = .52$, nor did it find a significant interaction effect, $F(1,109) = .74$, $p = .39$. These results do not support Hypothesis 2, at least in the context of a one-off decision about a home internet connection, that integral fear leads to a preference for the certain option in positive framing compared to negative framing.

A 2 * 2 ANOVA was then conducted to determine whether there were any differences in the Anger score due to framing condition and choice preference. The ANOVA did not find any significant effect of framing condition, $F(1,109) = 2.81$, $p = .1$, or choice preference, $F(1,109) = .08$, $p = .78$, nor did it find a significant interaction effect, $F(1,109) = .52$, $p = .47$. These results do not support Hypothesis 3, at least in the context of a one-off decision about a home internet connection, that integral anger leads to a preference for the risky option in negative framing compared to positive framing.

Given these results, we created positive and negative affect scores to investigate the role of integral affect (i.e. generalized positive or negative feelings) in risky-choice framing. The positive

Table 4. Fear and Anger scores (standard deviation) by framing condition and choice.

		Positive framing		Negative framing	
Emotion	Alpha	Certain outcome	Risky outcome	Certain outcome	Risky outcome
Fear (average of anxious, fearful, nervous)	.84	2.48 (1.34)	2.42 (1.36)	2.01 (1.11)	2.40 (1.42)
Anger (average of anger, mad)	.78	2.00 (1.34)	2.23 (1.50)	1.78 (1.06)	1.68 (.85)

Table 5. Positive and negative affect scores (standard deviation) by framing condition and choice.

		Positive framing		Negative Framing	
Affect	Alpha	Certain outcome	Risky outcome	Certain outcome	Risky outcome
Positive	.76	2.75 (0.92)	2.83 (1.06)	2.69 (0.95)	2.59 (1.02)
Negative	.91	2.12 (1.00)	2.16 (1.25)	1.84 (0.81)	1.94 (0.88)

affect score was created by averaging together the ratings for amused, engaged, happy, joyful, and interested. The negative affect score was created by averaging together the ratings for angry, anxious, disgusted, downhearted, fearful, frustrated, irritated, mad, nervous, repulsed, and sad. These scores are shown in Table 5.

A 2 * 2 ANOVA was conducted to determine whether there were any differences in Positive Affect due to framing condition and choice preference. The ANOVA did not find any significant effect of framing condition, $F(1,109) = .60$, $p = .44$, or choice preference, $F(1,109) = .002$, $p = .97$, nor did it find a significant interaction effect, $F(1,109) = .20$, $p = .66$.

Lastly, a 2 * 2 ANOVA was conducted to determine whether there were any differences in Negative Affect due to framing condition and choice preference. The ANOVA did not find any significant effect of framing condition, $F(1,109) = 1.76$, $p = .19$, or choice preference, $F(1,109) = .13$, $p = .72$, nor did it find a significant interaction effect, $F(1,109) = .02$, $p = .89$. These findings are consistent with the above findings about integral fear and anger and suggest at least in the context of a one-off decision about a home internet connection, that positive and negative affect cannot account for the effects of risky-choice framing.

2.3. Discussion

This study demonstrated that risky-choice framing can affect everyday decisions, in this case, choosing an internet service provider. Our findings are consistent with the well-established effects of risky-choice framing and support Hypothesis 1, that positively framed information leads to a preference for the certain option and negatively framed information leads to a preference for the risky option.

The practical implications of this study for understanding consumer behavior are straightforward; consumers would be more likely to choose an internet service provider if told about the network's reliability in certain terms as opposed to uncertain terms. Although the participants were not representative of the general population, the decision task had high ecological validity. It is very likely that the undergraduate student participants had or will have to make choices about home or mobile internet service providers and consider data about the reliability of a service provider's connection.

Having established that decisions about internet connectivity are subject to the effects of risky-choice framing, we sought to investigate whether integral fear and anger can account for the effects of risky-choice framing. We did not find evidence to support Hypothesis 2, that integral fear leads to a preference for the certain option in positive framing compared to negative framing. We did not find evidence to support Hypothesis 3 either, which states that integral anger leads to a preference for the risky option in negative framing compared to positive

Table 6. Asian disease decision problem with positively and negatively framed options (adapted from Tversky and Kahneman 1981).

Scenario			
Imagine that the U.K. is preparing for the outbreak of an unusual Asian disease, which is expected to kill 600 people. Two alternative programs to combat the disease have been proposed. Assume that the exact scientific estimate of the consequences of the programs are as follows:			
Positive framing condition		Negative framing condition	
Certain option	Risky option	Certain option	Risky option
If Program A is adopted, 200 people will be saved.	If Program B is adopted, there is 1/3 probability that 600 people will be saved, and 2/3 probability that no people will be saved.	If Program A is adopted, 400 people will die.	If Program B is adopted, there is 1/3 probability that nobody will die, and 2/3 probability that 600 people will die.

framing. Thus, we investigated whether more generalized measures of positive and negative affect can account for the effects of risky-choice framing. We did not find any evidence to support this either.

One reason we may not have found that integral fear and anger (and integral positive and negative affect) can account for the effects of risky-choice framing may have to do with the context of our decision problem. In our study, participants had to choose a home internet service provider, a rather banal task, based on information about the experiences of 100 customers. In Tversky and Kahnemann's (1981) Asian disease problem, participants had to make choices that would affect whether 600 people lived or died. Given that previous framing studies (Fagley and Miller 1997; Jou, Shanteau, and Harris 1996; Wang 1996) found people to be more risk-seeking for problems involving human lives than money, it may be that higher intensity integral emotions are induced by problems involving human lives, and that participants being more aware of these higher intensity integral emotions are better able to report them. Thus, we conducted a second study using the Asian disease problem to test Hypotheses 2 and 3 in a one-off decision involving human lives.

3. Study 2

This study used the classic Asian disease problem (Tversky and Kahneman 1981) to overcome the limitations in Study 1 of inducing low intensity integral emotions. We expected that higher intensity integral emotions would be induced by the Asian disease problem (i.e. a problem involving human lives) as compared to the Internet Connection decision problem, and that participants being more aware of these higher intensity integral emotions would be better able to report them. Thus, by using the Asian disease problem, we expected to find that integral fear leads to a preference for the certain option in positive framing compared to negative framing (Hypothesis 2), and that integral anger leads to a preference for the risky option in negative framing compared to positive framing (Hypothesis 3).

3.1. Method

3.1.1. Participants

Eighty undergraduate business/management students from the UK University participated in this study. They took part voluntarily and received class credit for participating. Their mean age was 22.97 years (SD = 4.93 years) with ages ranging from 21 to 50 years. There were 19 male participants (24%) and 61 female participants (76%). Participants were assigned randomly to one of the two experimental conditions (41 in the positive framing condition and 39 in the negative framing condition).

3.1.2. Procedure

This study was conducted as per Study 1 except that participants were presented with the Asian disease decision problem instead of the Internet Connection decision problem. On average, participants took 5.5 minutes to complete the study.[2] This study was approved by a university Research Ethics Committee.

3.1.3. Materials

The Asian disease decision problem used in this study is shown in Table 6. All the information for each condition (i.e. positive or negative framing) was presented on a single screen. Participants were asked 'Which of the two programs would you favour?' Immediately after the decision task, participants completed the same scale as Study 1 to rate the emotions felt during the decision-making task.

3.2. Results

3.2.1. Risky-choice framing

Table 7 shows the number and percentage of participants in each framing condition by choice preference. In the positive framing condition, most participants chose the certain option over the risky option (i.e. 76% vs. 24%). In the negative framing condition, most participants chose the risky option over the certain option (i.e. , 77% vs. 23%).

A z-test for two sample proportions was conducted to determine if there were any significant differences in choice preference depending on framing condition. The results were significant; $z = 4.7$, $p < .001$, two-tailed. Thus, we replicated the effects of risky-choice framing for the Asian disease problem; people preferred the certain option when information was framed positively (i.e. in terms of lives saved) but preferred the risky option when information was framed negatively (i.e. in terms of deaths). Further analyses revealed that the effects of risky-choice framing could not be attributed to gender or age.[3]

3.2.2. Integral emotions and integral affect

Table 8 shows the mean rating for each emotion by framing condition and choice. The intensities for all the emotions were low to moderate; the ratings were made on a seven-point scale with higher scores representing greater intensities.

To test Hypotheses 2 and 3, we created composite scores for fear and anger as per Study 1. These scores are shown in Table 9.

A 2 * 2 ANOVA was conducted to determine whether there were any differences in the Fear score due to framing condition and choice preference. The ANOVA did not find any significant effect of framing condition, $F(1,76) = .003$, $p = .96$, or choice preference, $F(1,76) = .5$, $p = .48$, nor did it find a significant interaction effect, $F(1,76) = .114$, $p = .74$. Even in this one-off decision involving human lives, these results do not support Hypothesis 2, that integral fear leads to a preference for the certain option in positive framing compared to negative framing.

A 2 * 2 ANOVA was then conducted to determine whether there were any differences in the Anger score due to framing condition and choice preference. The ANOVA did not find any significant effect of framing condition, $F(1,76) = .06$, $p = .82$, or choice preference, $F(1,76) = .3$, $p = .59$, nor did it find a significant interaction effect, $F(1,76) = .66$, $p = .42$. Even in this one-off decision involving human lives, these results do not support Hypothesis 3, that integral anger leads to a preference for the risky option in negative framing compared to positive framing.

Given these results, we created positive and negative affect scores as per Study 1, to investigate the role of integral affect (i.e. generalized positive or negative feelings) in risky-choice framing. These scores are shown in Table 10.

Table 7. Observed choice preferences by framing condition.

	Choice		
Framing	Certain	Risky	Total
Positive	31 (76%)	10 (24%)	41
Negative	9 (23%)	30 (77%)	39

Table 8. Mean emotion ratings (standard deviation) by framing condition and choice.

	Positive framing		Negative framing	
Emotion	Certain outcome	Risky outcome	Certain outcome	Risky outcome
Amused	1.97 (1.49)	1.40 (0.70)	2.00 (1.50)	2.10 (1.42)
Angry	1.94 (1.41)	2.20 (1.40)	1.89 (1.17)	2.30 (1.62)
Anxious	3.48 (1.63)	4.00 (2.21)	3.00 (1.50)	3.73 (1.89)
Disgusted	1.55 (0.96)	2.50 (1.65)	2.00 (1.32)	2.07 (1.31)
Downhearted	2.65 (1.62)	3.60 (2.12)	3.00 (2.40)	3.07 (1.82)
Engaged	4.13 (1.95)	3.60 (1.51)	3.89 (1.90)	4.27 (1.68)
Fearful	2.84 (1.95)	3.40 (1.84)	3.33 (2.29)	3.03 (1.97)
Frustrated	3.35 (1.91)	2.90 (2.13)	3.22 (1.92)	3.03 (1.88)
Happy	1.58 (1.18)	1.90 (1.29)	1.33 (0.71)	1.90 (1.63)
Joyful	1.68 (1.51)	2.00 (1.33)	1.33 (0.71)	1.83 (1.58)
Interested	4.29 (1.90)	4.60 (1.35)	4.11 (1.27)	4.53 (1.55)
Irritated	2.55 (1.77)	2.80 (1.93)	2.78 (1.30)	2.77 (1.87)
Mad	1.94 (1.39)	2.70 (1.57)	2.78 (1.72)	2.17 (1.76)
Nervous	2.97 (1.91)	3.30 (1.89)	3.33 (2.24)	3.40 (2.13)
Repulsed	1.61 (0.99)	1.90 (1.20)	2.11 (1.69)	1.93 (1.57)
Sad	2.45 (1.59)	2.60 (1.71)	3.11 (2.21)	2.53 (1.78)

Table 9. Fear and Anger scores (standard deviation) by framing condition and choice.

		Positive framing		Negative framing	
Emotion	Alpha	Certain outcome	Risky outcome	Certain outcome	Risky outcome
Fear (average of anxious, fearful, nervous)	.85	3.1 (1.59)	3.57 (1.80)	3.22 (1.91)	3.39 (1.73)
Anger (average of anger, mad)	.85	1.94 (1.35)	2.45 (1.28)	2.33 (1.35)	2.23 (1.60)

A 2 * 2 ANOVA was conducted to determine whether there were any differences in Positive Affect due to framing condition and choice preference. The ANOVA did not find any significant effect of framing condition, $F(1,76) = .003$, $p = .96$, or choice preference, $F(1,76) = .36$, $p = .55$, nor did it find a significant interaction effect, $F(1,76) = .48$, $p = .49$.

A 2 * 2 ANOVA was then conducted to determine whether there were any differences in Negative Affect due to framing condition and choice preference. The ANOVA did not find any significant effect of framing condition, $F(1,76) = .03$, $p = .86$, or choice preference, $F(1,76) = .27$, $p = .60$, nor did it find a significant interaction effect, $F(1,76) = .43$, $p = .52$. These findings are consistent with Study 1 and suggest that even in a one-off decision involving human lives, positive and negative affect cannot account for the effects of risky-choice framing.

3.2.3. Decision context

Although we did not find evidence to support Hypotheses 2 and 3, we expected that higher intensities of integral fear and anger would be induced by the Asian disease problem than by the Internet Connection decision problem used in Study 1. Table 11 shows the mean scores for integral fear and anger from each study, along with the scores for positive and negative affect.

As seen in Table 11, higher levels of integral fear and anger and integral positive and negative affect were induced by the Asian disease problem compared to the Internet Connection decision

Table 10. Positive and negative affect scores (standard deviation) by framing condition and choice.

		Positive Framing		Negative Framing	
Affect	Alpha	Certain Outcome	Risky Outcome	Certain Outcome	Risky Outcome
Positive	.81	2.73 (1.25)	2.70 (0.82)	2.53 (0.49)	2.93 (1.27)
Negative	.94	2.48 (1.18)	2.90 (1.49)	2.78 (1.47)	2.73 (1.42)

problem. Independent samples *t*-tests found these differences to be significant for Fear, $t(191) = 4.30$, $p < .001$, $d = 0.63$, and Negative Affect, $t(191) = 3.91$, $p < .001$, $d = 0.56$, but not for Anger, $t(191) = 1.37$, $p = .17$ and Positive Affect, $t(191) = 0.49$, $p = .63$. These findings suggest that the context of a risky-choice framing decision problem, in this case one involving human lives compared to one involving a home internet connection, can induce different intensities of integral emotions and integral affect.

We then compared the choice preferences between studies for each framing condition to determine whether any differences in choice preferences might be explained by the higher intensities of integral fear and integral negative affect. The choice preferences in the positive and negative framing conditions are shown again in Tables 12 and 13, respectively.

For the positive framing condition, as seen in Table 12, there was a greater preference for the certain option in the Asian disease problem compared to the Internet Connection decision problem (76% vs. 59%). A z-test for two sample proportions however revealed that this difference was not significant; $z = 1.7$, $p = 0.08$, two-tailed.

For the negative framing condition, as seen in Table 13, there was a greater preference for the risky option in the Asian disease problem compared to the Internet Connection decision problem (77% vs. 61%). A z-test for two sample proportions however revealed that this difference was not significant; $z = 1.7$, $p = 0.10$, two-tailed. These findings suggest that there were no differences in choice preferences between our two studies in either framing condition. Thus, the higher levels of integral fear and integral negative affect reported in Study 2 compared to Study 1 cannot be used to account for the effects of risky-choice framing.

3.3. Discussion

This study replicated the well-established effects of risky-choice framing using the Asian disease problem. The main purpose of this study though was to use the Asian disease problem to overcome the limitations in Study 1 of inducing low intensity integral emotions to test Hypotheses 2 and 3. We found that compared to the Internet Connection decision problem used in Study 1, the Asian disease problem induced substantially higher intensities of integral fear and integral negative affect. In a one-off decision using the Asian disease problem, however, we did not find evidence that integral fear leads to a preference for the certain option in positive framing compared to negative framing (Hypothesis 2), nor did we find evidence that integral anger leads to a preference for the risky option in negative framing compared to positive framing (Hypothesis 3).

Our findings are not consistent with the emerging literature which suggests a role for affect and emotions in risky-choice framing, but unlike our studies, previous research did not investigate integral emotions (or integral affect) in a one-off decision. Stark et al. (2017) found that positively framed options (i.e. lives saved) elicited a more positive mood than negatively framed options (i.e. deaths), but they achieved their result by collapsing their findings across three decision problems, not accounting for carry-over effects or incidental influences from one decision problem to the next. They did not report and compare mood scores by framing condition for each of the three decision problems. Similarly, Druckman and McDermott (2008) findings that for the Asian disease problem, higher levels of anger were associated with a greater preference for the risky option, and higher levels of distress were associated with a greater preference for

Table 11. Mean emotion and affect ratings (standard deviation) by study.

Emotion	Study 1 (Internet Connection decision problem)	Study 2 (Asian disease problem)
Fear	2.35 (1.32)	3.28 (1.68)
Anger	1.90 (1.19)	2.16 (1.42)
Positive affect	2.70 (0.98)	2.78 (1.14)
Negative affect	2.01 (0.98)	2.66 (1.33)

Table 12. Observed choice preferences in the positive framing condition by study.

	Choice		
Study	Certain	Risky	Total
1 (Internet connection)	32 (59%)	22 (41%)	54
2 (Asian disease)	31 (76%)	10 (24%)	41

Table 13. Observed choice preferences in the negative framing condition by study.

	Choice		
Study	Certain	Risky	Total
1 (Internet connection)	23 (39%)	36 (61%)	59
2 (Asian disease)	9 (23%)	30 (77%)	39

the certain option, might also be explained by incidental influences induced by their experimental method; they required participants to complete four decision tasks and then a background questionnaire which included ratings of emotions. Given these considerations, the previous literature suggests a moderating role for incidental emotions in risky-choice framing. Our findings suggest that in a one-off decision, when the incidental influences of other decision tasks are not present, integral fear and anger cannot account for the effects of risky-choice framing.

The main limitation in our studies is how we measured integral emotions (i.e. emotions induced from the decision problem and felt at the time of the decision). Immediately after the decision task, participants were instructed to 'indicate the greatest amount of each emotion you felt at any time when choosing your preferred program' for 16 emotions. In terms of the EIC model, 'current emotions' and 'conscious and/or nonconscious evaluation' reciprocally influence each other, thus these ratings may reflect 'recalled emotions' as opposed to 'current emotions' because participants made them after indicating their choice preference, although immediately afterwards. As mentioned earlier, we designed our studies this way to prevent biasing participants by asking them to consider their emotions before making their decision as per Stark et al. (2017). Future research could include psycho-physiological measures to detect somatic markers (Damasio 1994; Bechara and Damasio 2005) to help overcome this limitation and measure emotional response less obtrusively during the decision-making process. Our method though was valid as we found that the Asian disease problem (i.e. a problem involving human lives) used in Study 2 induced substantially more integral fear and integral negative affect than the Internet Connection decision problem used in Study 1.

Although we found differences in integral fear and integral negative affect between our two studies, we did not find any differences in choice preferences between them by framing condition. This was surprising given that previous research (Fagley and Miller 1997; Jou, Shanteau, and Harris 1996; Wang 1996) found participants chose the risky option significantly more often for problems involving human lives. One reason why we may not have observed a greater preference for the risky option in Study 2 (which used the Asian disease problem) compared to Study 1 (which used the Internet Connection decision problem), may be due to different demand characteristics between our two studies and previous research. Participants completed both of our studies online in their own time (i.e. outside of a classroom or laboratory setting, and not in the presence of an experimenter). This method was not particularly easier in terms of study

administration, but we deemed it to be a more ecologically valid method as people today are making more decisions online (Darley, Blankson, and Luethge 2010). We conducted a pilot test of our method with 10 participants (five per framing condition) and they did not report any problems or concerns in short follow-up interviews. The second author also stressed the importance of completing the study alone in a quiet location during a lecture earlier on in the day that participants were emailed a link to the study. Our findings suggest that the effects of risky-choice framing may be just as strong for problems about internet connectivity as human lives. Certainly, further research is needed to determine the reliability of the preference for the risky option for human lives when the decisions are made privately online as opposed to within a laboratory setting.

4. General discussion

Previous research (e.g. Druckman &McDermott, 2008; Stark et al. 2017) has pointed to a role for affect and emotions in risky-choice framing. That research though has not investigated specific integral emotions in a one-off decision. The aim of this article was to extend the risky-choice framing literature by using the EIC model to investigate the roles of integral fear and anger in a one-off decision. In two studies using decision problems about internet connectivity and human lives respectively, we expected to find higher levels of integral fear in participants who chose the certain option in the positive framing condition as compared to the negative framing condition, and also higher levels of integral anger in participants who chose the risky option in the negative framing condition as compared to the positive framing condition. We did not find evidence to support either of our hypotheses despite significant effects of risky-choice framing on choice preferences in both studies. We did not find evidence that positive or negative integral affect could account for the effects of risky-choice framing either. Our findings suggest that the risky-choice framing effect is not caused by an emotional response.

Although we did not find evidence to support our hypotheses, our findings should not be considered null results. Rozin, Millman, and Nemeroff (1986) demonstrated that once attached to decision targets, integral emotions become difficult to detach. Thus, it may be that risky-choice framing prevents integral emotions from becoming attached to the choice options. Our findings support this explanation as we did not observe high intensity integral emotions and did not find that integral fear or anger could account for the effects of risky-choice framing in either of our studies. In a one-off decision, positive or negative framing of certain and risky choice options may prevent integral emotions from becoming attached to those options because the choice architecture may offer a decision-making tactic that is less effortful than considering one's emotional response to those options. In other words, choosing the certain option in positive framing (i.e. sure gain) and choosing the risky option in negative framing (i.e. avoiding the sure loss) may be a less effortful heuristic than relying on affect or emotions to make a decision. This explanation about less effortful processing is consistent with studies that have demonstrated that framing effects can be removed by requiring participants to engage in effortful processing like elaboration or justification of their decision (e.g. Cheng, Wu, and Lin 2014). Future research though should continue to investigate integral emotions in risky-choice framing. For example, our proposed explanation about risky-choice framing preventing integral emotions from attaching themselves to choice options, could be investigated by comparing the emotional reactions to the choice options when presented individually (i.e. not as part of a risky-choice framing problem) to the emotional reactions to the same choice options reported in our two studies.

The two studies presented in this article demonstrated that in a one-off decision, integral fear and anger cannot account for the effects of risky-choice framing, nor can positive or negative integral affect. Lerner et al. (2015) argued that 'by involving relatively unconscious influences, choice architecture provides a promising avenue for reducing the impact of unwanted emotions'.

Consistent with this assertion, we conclude that the risky-choice framing effect is not driven by an emotional response because the choice architecture involved may prevent integral emotions from becoming attached to the choice options.

Notes

1. We conducted two binary logistic regressions, one for gender and one for age. We coded the dependent variable, choice preference, such that 0 was the certain outcome and 1 was the risky outcome. We coded the predictor, frame, such that 0 was the positive frame and 1 was the negative frame. We found a significant positive coefficient for the frame variable, 0.82 (SE = .39), $p = 0.032$, which is just another way of reporting that the negative frame led to a preference for the risky choice. For the first regression, we then added gender as another predictor, coding it such that 0 was male and 1 was female but did not find a significant coefficient for gender, p = .72, nor did we find a significant coefficient for the frame * gender interaction, p = .69. For the second regression, we added age as the second predictor but did not find a significant coefficient, p = .46, nor did we find a significant coefficient for the frame * age interaction, $p = .46$.
2. We collected our data in 2018, well before the COVID-19 pandemic, which began in Asia.
3. We conducted two binary logistic regressions, one for gender and one for age. We coded the dependent variable, choice preference, such that 0 was the certain outcome and 1 was the risky outcome. We coded the predictor, frame, such that 0 was the positive frame and 1 was the negative frame. We found a significant positive coefficient for the frame variable, 2.34 (SE = .53), $p < .001$, which is just another way of reporting that the negative frame led to a preference for the risky choice. For the first regression, we then added gender as another predictor, coding it such that 0 was male and 1 was female but did not find a significant coefficient for gender, $p = .13$, nor did we find a significant coefficient for the frame * gender interaction, p = .99. For the second regression, we added age as the second predictor but did not find a significant coefficient, p = .43, nor did we find a significant coefficient for the frame * age interaction, p = .33.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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