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Cognitive Psychology

Speakers' Choice of Frame Reveals Little About Their Trait Emotions but More About Their Preferences and Risk Perception

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People's decisions depend on how situations are described or framed to them. But how do speakers frame outcomes to others? What factors predict whether a speaker chooses to frame an investment opportunity in terms of its chances of failure or success? Drawing on the appraisal tendency framework, we investigated whether emotions associated with uncertainty (worry) might increase speakers' preference for negative framing, whereas emotions associated with certainty (anger) might increase speakers' preference for positive framing. Across two well-powered preregistered studies (N_{Total} = 1,350), participants responded to measures of dispositional worry and anger and completed framing tasks in different contexts. We told participants that a job applicant/investment in a medical treatment had an estimated chance of failure vs success (e.g., 40% chance of failure and 60% chance of success) and asked them whether they would describe the predicted outcome to their manager in terms of chances of failure or chances of success. Overall, we found little evidence for our hypothesized influence of dispositional worry and anger on framing using our preregistered analysis. However, exploratory analyses revealed that the predicted associations appeared when participants perceived high levels of risk in the decision scenarios. A stronger effect on frame preference was found for risk perception and willingness to recommend a decision, indicating that frames reveal more about such idiosyncratic responses than about emotional traits. Preregistrations, data, code, and materials can be found at https://osf.io/3e98a/.

People's decisions are susceptible to how options are described to them (i.e., framed). Describing meat as "75% lean" instead of "25% fat" increases consumers' purchase intentions (Levin, 1987), describing events in terms of their chances of success rather than failure generates more favorable evaluations (Davis & Bobko, 1986; Dunegan, 1993), and medical treatments described in terms of survival rates instead of mortality rates are more likely to be approved (Marteau, 1989; Wilson et al., 1987). Such behavior seemingly violates assumptions of rational choice: both frames are logically equivalent and should not lead to different evaluations. However, even if two frames are logically equivalent, they can convey different meanings to listeners and elicit different reactions (McKenzie & Nelson, 2003; Sher & McKenzie, 2006).

Going beyond an examination of how frames are interpreted, some studies have examined how frames are produced. Indeed, not only are listeners' evaluations influenced by the frame that they receive, but speakers seem to select frames strategically to convey information beyond the literal meaning of the message itself (Halberg & Teigen, 2009; Honda & Matsuka, 2014; Karevold & Teigen, 2010; Keren, 2007; Løhre et al., 2019; Teigen, 2015; Teigen & Karevold, 2005; van Buiten & Keren, 2009). From a linguistic perspective, verbal expressions serve pragmatic functions that signal the speakers' intentions and interests that implicitly encourage or discourage a course of action (Hilton, 2008). Speakers' verbal expressions also have an impact on listeners' emotions. A large-scale study found that COVID-19 messages that were framed in terms of losses (vs gains) increased anxiety (Dorison et al., 2022).

Given the strong influence of frames, understanding the factors that influence framing itself can offer important insight. This is a relatively overlooked but important domain of decision making, with only a few studies investigating factors that influence speakers' frame selection. In this paper, we draw on the appraisal tendency framework (Lerner & Keltner, 2000, 2001) to examine the influence of discrete incidental emotions on frame preference. Levin et al. (1998) proposed that exposure to stimuli unrelated to the task at hand sets up an "evaluative tone" which determines how people encode and respond to negative and positive labels

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of an attribute. We propose that worry—an emotion characterized by low certainty and personal control—leads to a preference for negative frames, whereas anger—an emotion characterized by high certainty and personal control—leads to a preference for positive frames.

Worry and anger play an important role in decisions associated with uncertainty and control, such as those involving risk. These emotions may also be consequential in frame selection, for example when deciding whether to frame a decision in terms of chances of success or failure. Those more disposed to worry presumably attend more to negative information and communicate this to others, while those more disposed to anger might be more willing to ignore possible negative outcomes and to emphasize positive expectations. To our knowledge, no study has compared the influence of specific emotions on frame selection.

Theory and Hypotheses

Tversky and Kahneman (1981) argued that the decision-making process can be divided into two phases: coding and evaluation. In the coding phase, which is typically the first step in the decision-making process (Fischhoff, 1983), individuals can either passively accept the frames provided by others or form their own according to their subjective reference point. In other words, people do not only occupy the roles of listeners receiving external frames but also form their own frames and may express these frames to others. While effects of framing on the perceptions and decisions of listeners are well-established in judgment and decision-making research, less is known about how speakers frame outcomes when communicating them to others.

In the present study, we focus on attribute framing—a particular type of framing "in which some characteristic of an object or event serves as the focus of the framing manipulation" (Levin et al., 1998, p. 150). A common application of attribute framing involves describing events in terms of success versus failure rates (Levin et al., 1998). An investment opportunity can be framed as having an estimated 40% chance of success or a 60% chance of failure. Although both frames are logically equivalent, listeners evaluate them differently.

Some researchers have criticized the assumption of logical equivalence, arguing that even if two options are logically equivalent, they may "leak" different information (Leong et al., 2017; Sher & McKenzie, 2006). For instance, being told that an investment opportunity in a medical treatment has a predicted 20% chance of failure (vs 80% chance of success) implicitly tells a listener that the speaker believes it is the possibility of failure that deserves attention, and thus suggests that the treatment should not be invested in. From this perspective, listeners do not necessarily behave "irrationally" when they respond differently to different frames. Instead, they make inferences about the state of affairs based on the information provided by a speaker and try to act accordingly.

Moving beyond an examination of listeners' reactions to frames, our study focuses on how speakers frame outcomes to others. McKenzie and colleagues have shown that speakers frame outcomes based on a reference point—that is, the initial, expected, or typical level of an attribute (McKenzie & Nelson, 2003). A speaker is more likely to say that a vaccine against a particular virus has a 70% chance of success rather than a 30% chance of failure if the level of effectiveness was unexpected. On the other hand, a speaker is more likely to refer to the percentage of failure if this level of failure is higher than expected, with the usual level of effectiveness acting as a reference point.

In general, studies of frame selection have found that speakers prefer frames that emphasize an increasing component (e.g., a speaker would call a glass "half-full" if it was previously empty) and frames that emphasize the largest component (e.g., 80% chance of success rather than 20% chance of failure). Studies have also documented a "positivity bias" where speakers prefer positive frames (Daniels & Zlatev, 2019; Halberg & Teigen, 2009; Keren, 2007; Sher & McKenzie, 2006; Teigen, 2001; van Buiten & Keren, 2009; Wang, 2004). For instance, Wang (2004) measured people's choice of framing in terms of gains and losses by using a modified version of the Unusual Disease problem.[1] In the classic Unusual Disease problem, participants read about the spreading of a deadly virus and are asked to choose between two alternative programs to combat the disease—a safe program which will save 200 (out of 600) people with 100% certainty, and a risky program which has a ⅓ probability of saving 600 people and a ⅔ probability of saving none. Tversky and Kahneman (1981) used the Unusual Disease problem to demonstrate how listeners' choices are influenced by whether the risky and safe options are framed in terms of gains ("lives saved") or losses ("lives lost"). In Wang's (2004) study, participants saw an incomplete version of the Unusual Disease problem in which a pie graph ambiguously displayed the expected outcomes of the "safe" and "risky" programs. They were then asked to complete sentences that described each program. The study found a general preference for describing the expected outcomes using positive words (e.g., save, survive) over negative words (e.g., die, not die). Similarly, Sher and McKenzie (2006) asked participants to describe the track record of a team that had undertaken 50 projects, 20 of which were failures and 30 of which were successes. Most preferred to describe the team in terms of their successes rather than failures (i.e., 20 of the projects were successful, rather than 30 of the projects were failures).

One explanation for this "positivity bias" has to do with the speaker's motivation to persuade listeners. For instance, Keren (2007) showed that speakers who were instructed to maximize sales tended to select the positive

1 We use the more contemporary label instead of "Asian Disease Problem".

frame ("80% lean meat"). Thus, speakers judge the persuasiveness of frames by placing themselves in the listener's position to predict how they will react to a given frame. Another explanation for the predominance of positive frames refers to the linguistic concept of markedness (Holleman & Pander Maat, 2009). Most attributes that have opposite poles, like full-empty, tall-short, or good-bad, are asymmetrical in that one of the poles is more neutral than the other. For instance, while asking someone how tall they are is a relatively neutral question, asking how short they are can be seen as an insult or perhaps a joke. This asymmetry makes the use of a marked term like "failure" a clear negative signal, while the unmarked term "success" can be used to describe both larger and smaller chances (Pander Maat et al., 2021).

But how do individual differences influence frame selection? Indeed, an individual's representation of a problem is influenced not only by the explicit, "objective" information provided in the task but also by internal aspects, such as their emotions. According to Tversky and Kahneman (1981), "the frame that a decision maker adopts is controlled partially by the formulation of the problem and partly by the norms, habits and personal characteristics of the decision-maker'' (p. 453). A few studies have investigated the influence of individual characteristics on frame selection. Using Wang's (2004) self-framing task, McElroy et al. (2007) found that individuals with high self-esteem were more likely to use positive words (e.g., "rescued" and "survival") to describe a frame, whereas those with low self-esteem were more likely to use negative words (e.g., "death" and "loss of life"). Peng et al. (2019) found that chronic and situational regulatory focus influenced participants' framing of the Unusual Disease problem. Specifically, promotion-oriented individuals were more likely to use positive words to describe the problem, whereas prevention-focused individuals were more likely to use negative words. Relatedly, optimistic people have been found to generate more positive frames in the Unusual Disease problem and to prefer risky options (Zhang et al., 2020).

Although a large body of research has documented the effects of emotions on judgment and decision making, very little research has investigated the effects of emotions on framing. Moving beyond a dichotomous view of emotions as positive vs. negative, the appraisal tendency framework (Lerner & Keltner, 2000, 2001) posits that emotions of the same valence can produce opposing effects on judgments and decisions. For instance, while worry and anger are both negative and high-arousal emotions, they lead to opposite effects on risk seeking due to their unique underlying appraisals. Worry is associated with appraisals (i.e., perceptions) of low certainty and low individual control, whereas anger is associated with appraisals of high certainty and high personal control. As a result, worry causes people to become risk averse, whereas anger causes people to become risk seeking.

Moreover, these appraisals are believed to have carry-over effects on judgment and behavior. In particular, the appraisal tendency perspective argues that emotional individuals are predisposed to interpret subsequent events in line with the appraisal patterns characterizing their emotion (Lerner & Keltner, 2000, 2001). For example, anxiety is elicited when an event is experienced as uncertain and situation-controlled (e.g., a looming economic crisis). This anxiety, in turn, might cause people to perceive uncertainty and low personal control in a subsequent decision that is unrelated to the emotion-eliciting source itself. In one of their first demonstrations of the opposite effects of fear and anger on risk-related judgments, Lerner and Keltner (2001) found that dispositionally anxious people were less likely to choose the risky option in the Unusual Disease problem and expressed more pessimistic risk estimations, with opposite results for dispositionally angry people.

Given that worry and anger are characterized by appraisals that are seemingly highly relevant in decisions involving the framing of estimated outcomes, we predicted that these emotions would lead to opposite effects on speakers' choice of frame. Worried people might prefer negative frames since negative information attracts their attention, and they may believe that others should also consider what might go wrong. On the other hand, angry people might prefer positive frames since they are more willing to take risks and thus would encourage others to consider what might go right.

Previous studies have shown that fear typically promotes avoidance of potential negative events and stimuli (Harmon-Jones & Allen, 1998; Öhman & Mineka, 2001), whereas anger promotes approach-oriented actions (Lerner & Tiedens, 2006; Litvak et al., 2010). These orientations also have implications for how people attend to losses versus gains. Fear increases attention to potential threats (i.e., losses) (Maner & Gerend, 2007), whereas anger increases attention to potential rewards (i.e., gains) (Ford et al., 2010). Consistent with the idea that fear and anger differ in their orientation towards losses and gains, Gerend and Maner (2011) found that loss frames were more effective in promoting health-related behaviors among people induced with fear, whereas gain frames were more effective among participants who were induced with anger.

A study by Peng et al. (2014) found that individuals with high levels of trait anxiety were more risk averse and used more negative words to construct their frames, as shown with the same open-ended version of the Unusual Disease paradigm developed by Wang (2004). Zhang et al. (2020) found that optimistic people used more positive words to describe outcomes. Similarly, Peng et al. (2019) found that promotion-oriented individuals selected more positive frames and prevention-oriented individuals more negative frames. Collectively, these findings support our proposed opposite effects of worry and anger on framing.

Taken together, we predicted that worried people would have a higher preference for negative framing and that angry people would have a higher preference for positive framing.

Overview

We conducted two preregistered studies. In both studies, participants answered measures of dispositional worry and anger and completed two frame selection tasks. The first

task concerned the recruitment of a new manager. The second task concerned an opportunity to invest in an innovative medical treatment. In the tasks, participants were told that a job applicant or medical treatment had an estimated chance of success (vs failure) and were asked whether they would frame the decision in terms of its chances of success or failure.

Across the two studies, we also manipulated the chances of success and failure. In Study 1, participants were randomly assigned to one of two conditions. In the first condition, we presented the job applicant and medical treatment as having a 20% chance of failure and 80% chance of success, while in the second condition, we presented them as having a 40% chance of failure and 60% chance of success. In Study 2, we used a 50%-50% condition and a 60% chance failure/40% chance success condition.

Before running these two studies, we ran a preregistered pilot study that tested the impact of manipulated incidental fear and anger on gain and loss framing. Overall, we found no evidence for an effect of the emotion condition on frame preference (see the supplementary file in the "Supplementary Material" folder on the OSF project page: https://osf.io/3e98a/).

Finally, we include additional post-hoc analyses to probe null findings and discuss their implications for studying the influence of emotions on frame selection.

Transparency Statement

All studies received approval from the Norwegian Center for Research Data (NSD) before data collection. Participants in each study provided their consent to participate. We report how we determined the sample size, all data exclusions, all manipulations, and all measures collected in this study (Simmons et al., 2012). We preregistered our studies on the Open Science Framework (OSF) before data collection. All analyses were carried out in RStudio 1.4.1106 (RStudio Team, 2022). The preregistrations, data, code, and supplementary materials are available on the OSF repository (https://osf.io/3e98a/).

Study 1

In the preregistered pilot study (see supplementary file), we found no effect of experimentally induced fear and anger on participants' preference for loss vs gain frames. In Study 1, we decided to measure individuals' dispositional worry and anger (which we refer to as trait worry and trait anger) rather than attempt to induce these emotions. Second, instead of focusing on individuals' preference for framing in terms of gains or losses in a version of the Unusual Disease problem (as in the pilot study), we used an attribute framing task to measure whether individuals prefer to frame decisions in terms of their chances of failure or success.[2] We did this in an attempt to obtain more variation in participants' choices, as a large majority chose the gain frame in the pilot study. The Study 1 preregistration can be found at https://osf.io/r9qcu.

Methods

Participants

A total of 700 participants (347 males, 344 females, 9 other/prefer not to answer; M_{age} = 35.57, SD_{age} = 12.00) were recruited from Prolific. We prescreened participants such that we only included those who were native/fluent English speakers, resided in the UK, were above 18 years old, had an approval rate of at least 98%, and had completed at least 50 submissions. We also ensured an equal gender distribution in our sample. Participants were paid £1.00 for the roughly eight-minutes long study. As per the preregistration, we report our results using the complete dataset.

We estimated the sample size by performing an a-priori power analysis (using GPower 3.1.9.4; Faul et al., 2007) for a hierarchical linear regression model predicting frame preference. The power analysis indicated that we needed a sample of 647 participants to detect a small effect size (f^2 = 0.02. The limited number of studies in this area of research made it difficult to obtain an accurate estimate of the effect size. Nevertheless, we based our estimate on a meta-analysis by Wake et al. (2020) that examined the effect of fear on risk taking. The meta-analysis included studies that have either manipulated fear or measured fear as a trait variable. In addition, many of the studies included in the meta-analysis measured risk taking using classic framing problems, which resemble the tasks in our study. We entered the effect size estimate into the power analysis with the following input parameters: α = 0.05, power = 0.80, and the number of tested predictors = 5. We aimed to collect up to 700 participants to account for any necessary exclusions.

To examine any potential issues, we also preregistered to exclude participants who spent < 3 minutes on the experiment, indicated low English proficiency (< 5 on a 7-point Likert scale), reported not being serious about filling in the survey (< 4 on a 5-point Likert scale), failed a bot check, failed two comprehension checks, and those who had correctly guessed the purpose of the study. These exclusions did not significantly alter the results.

Design and Procedure

The study employed a two-condition between-subjects design. Participants first completed measures of trait worry and trait anger. Next, they were randomly assigned to two different versions of the frame selection task. In both conditions, participants received two scenarios describing different decision situations, with one scenario concerning a recruitment decision and the other an investment in a med-

2 We also included the frame selection task from the pilot study to examine whether trait worry and anger predicted gain and loss framing. The associations were not significant. See the supplementary file for the results.

ical treatment. As described below, an applicant or a medical treatment was said to have a 20% chance of failure and an 80% chance of success in one condition or a 40% chance of failure and a 60% chance of success in the other condition. Participants were asked whether they would use the success or failure frame to describe the applicant (or the investment opportunity) to their manager, who would make the final decision to hire the candidate (or invest in the medical treatment). The order in which scenarios were presented to participants was counterbalanced.

Measures

Frame Selection Task. We designed a frame selection task that consisted of two scenarios in different domains. One in the domain of recruitment and the other in the medical domain. These scenarios were modeled on existing attribute framing problems.

The recruitment scenario read as follows:

> Imagine that you work for the HR department at a large company in your city. The company is planning to recruit a new manager for one of the company's new branches and has received applications from several people. A consultant in your company evaluates one of these applications (by looking at the resume and intelligence and personality scores) and says that there is an 80% **[60%]** chance that this applicant will succeed and a 20% **[40%]** chance that the applicant will fail as a manager of the new branch. Your task is to communicate this to your HR manager who will make the final hiring decision.
>
> The medical investment scenario read as follows:
>
> Imagine that you work for a large healthcare organization in your city that has received an offer from a team of scientists to invest in the development of an innovative treatment for cancer. A medical expert in your organization evaluates this treatment and says that it has an 80% **[60%]** chance of success and a 20% **[40%]** chance of failure. Your task is to communicate this to your manager who will decide whether or not to invest in the treatment.

After each scenario, participants were asked to choose one of two frames to communicate the decision to their manager: framing the decision in terms of its failure (e.g., "there is a 20% chance of failure") or in terms of its success (e.g., "there is an 80% chance of success"). Next, we asked them to rate their preference for one frame over the other on a 13-point scale (-6 = *Strongly prefer Option A*, i.e., negative frame, 0 = *No preference*, 6 = *Strongly prefer Option B*, i.e., positive frame). For our analyses below, we used their average frame preference across the two scenarios. Higher scores indicate a preference for positive framing.

Trait Worry and Anger. Trait worry was measured using the unidimensional Penn State Worry Questionnaire (Meyer et al., 1990). Responses were measured on a 5-point Likert scale (1 = *Not at all typical of me*, 5 = *Very typical of me*). Example items included "If I do not have enough time to do everything, I do not worry about it" (reverse-coded), "My worries overwhelm me," and "I have been a worrier all my life." The scale has been used in previous studies examining risky judgment and decision making (e.g., Maner et al., 2007; Mayiwar & Björklund, 2021). The scale demonstrated strong reliability (α = .96). Although some theorists conceptualize worry and fear as two different emotions, emotion and decision-making studies often do not differentiate between them. A meta-analysis of fear and risk taking by Wake et al. (2020) found no differences between studies that referred to "fear" and those that referred to "anxiety." Nevertheless, we chose trait worry as uncertainty—the key appraisal dimension driving the effects on judgments and decisions—seems more characteristic of worry and anxiety than fear.

We measured trait anger using a 10-item scale developed by Lerner and Keltner (2001). This scale has also been used in studies examining risky judgment and decision making (e.g., Lerner & Keltner, 2001; Mayiwar & Björklund, 2021). The scale demonstrated good reliability (α = .87). Subjects rated the extent to which various behaviors were typical of them. Example items include "I often find myself feeling angry" and "Other drivers on the road infuriate me." Responses were measured on a 7-point Likert scale (1 = *Not at all true of me*, 7 = *Very true of me*).

Risk Perception and Willingness to Recommend. Once participants had selected a frame and indicated their frame preference, we followed up with two additional questions. First, we asked them to indicate their willingness to recommend the applicant/treatment on a seven-point scale. We also told participants that management decided to hire the candidate/invest in the medical treatment and asked them how risky they perceived each decision, again using a seven-point scale. We included these variables to assess whether those who perceived higher risk would be more likely to prefer negative frames and whether those who indicated a higher willingness to recommend the applicant/treatment would be more likely to prefer positive frames.

Results

Descriptives

Bivariate correlations among the key variables are shown in Table 1.

Worry and anger were not correlated with any of the variables. Average risk perception (across the two scenarios) was negatively correlated with frame preference (r = -.28**), indicating that perceiving higher risk in the decisions was associated with a decreased preference for positive framing. Average willingness to recommend decisions (across the two scenarios) was positively related to average frame preference (r = .53**), indicating that those who reported a higher willingness to recommend the job applicant or medical treatment had a stronger preference for positive framing.

Chance condition (0 = 20% chance failure, 80% chance success, 1 = 40% chance failure, 60% chance success) was positively correlated with risk perception (r =.45**) and negatively correlated with willingness to recommend (r = -.46**). This suggests that participants who were told that the job applicant and medical treatment had a 20% chance

Table 1. Means, standard deviations, and correlations (Study 1)

Variable	*M*	*SD*	1	2	3	4	5
1. FP	2.95	2.41					
2. Worry	4.04	0.91	-.02				
3. Anger	3.59	1.10	.02	.34**			
4. Chance	0.50	0.50	-.19**	.00	-.02		
5. RP	3.56	1.10	-.28**	.01	.04	.45**	
6. WR	5.01	1.05	.53**	.06	.05	-.46**	-.57**

Note. *M* and *SD* are used to represent mean and standard deviation, respectively. FP = preference for positive over negative frame, Chance (0 = 20% chance failure, 80% chance success, 1 = 40% chance failure, 60% chance success), RP = risk perception, WR = willingness to recommend decisions. * $p < .05$. ** $p < .01$.

of failure and 80% chance of success (vs 40% chance of failure and 60% chance of success) perceived lower risk in the decisions and were more willing to recommend the applicant/investment.

Frame Preference Across the Chance Conditions and Scenarios

We did not preregister any predictions about how the manipulation of chances of success vs failure would impact frame preference. Preference for positive frames was significantly higher in the 20/80 condition ($M = 3.40$) compared to the 40/60 condition ($M = 2.49$), $t(698) = 5.13$, $p < .001$, $d = 0.39$, 95% CI [0.24, 0.54]. This indicates that participants had a stronger preference for positive frames when chances of success were higher, serving as an initial validation of our frame preference measure.

It is also noteworthy that most participants selected the positive frame, regardless of the chance condition (Figure 1). This is consistent with the results from the pilot study, where an overwhelming majority of participants chose the gain frame over the loss frame.

Hypothesis Testing

We fitted a hierarchical linear regression model with frame preference as the outcome variable and chance condition (20% chance failure, 80% chance success vs 40% chance failure, 60% chance success), trait worry, and trait anger as predictors. Continuous predictors were standardized. We only present the results from the final, overall model.

Contrary to our predicted main associations, neither trait worry nor anger predicted frame preference (worry: $\beta = -0.07$, $p = .455$ (two-tailed), 95% CI = -0.23, 0.09; anger: $\beta = 0.06$, $p = .512$ (two-tailed), 95% CI = -0.09, 0.22).[3]

Exploratory Analysis

We proceeded with exploratory analysis to examine whether the predicted associations depended on the chance condition. We ran the same regression model as above, except that we also added the interaction between trait worry and chance condition and trait anger and chance condition. All continuous predictors were standardized before running the analyses. As shown in Table 2, both interactions were significant (trait worry × chance: $\beta = -0.44$, $p = .021$ (two-tailed), 95% CI = -0.81, -0.07; trait anger × chance: $\beta = 0.49$, $p < .01$ (two-tailed), 95% CI = 0.12, 0.8)]. Figure 2 shows that worry and anger predicted frame preference as hypothesized but only in the 40/60 chance condition.

Simple slopes analysis indicated that the relationship between trait worry and frame preference was significant and negative in the 40/60 condition ($\beta = -0.27$, $p = .035$) and insignificant and positive in the 20/80 condition ($\beta = 0.16$, $p = .236$). Similarly, the relationship between trait anger and frame preference was significant and positive in the 40/60 condition ($\beta = 0.30$, $p = .024$), and insignificant and negative in the 20/80 condition ($\beta = -0.19$, $p = .159$).

Discussion

Study 1 found no significant relationship between trait worry and frame preference or trait anger and frame preference when averaged across the two chance conditions. Nevertheless, exploratory analyses indicated that the predicted associations emerged in the condition where scenarios indicated a 40% chance of failure and a 60% chance of success. According to the appraisal tendency framework (Lerner & Keltner, 2000, 2001), the opposite effects of fear and anger on judgments involving risk should only emerge when judgments are perceived as ambiguous with respect

3 Since each trait measure was tested while controlling for the other, functionally, these coefficients can be interpreted as "worry minus anger" and "anger minus worry". To simplify the interpretation of the results, we ran two separate regression models; one that only included trait worry and one that only included trait anger. The results remained similar (trait worry: $\beta = -0.05$, $p = .588$ (two-tailed), 95% CI = -0.23, 0.13; trait anger: $\beta = 0.05$, $p = .601$ (two-tailed), 95% CI = -0.12, 0.19). Chance condition was the only significant predictor, $\beta = -0.92$, $p < .001$ (two-tailed), 95% CI [-1.27, -0.57].

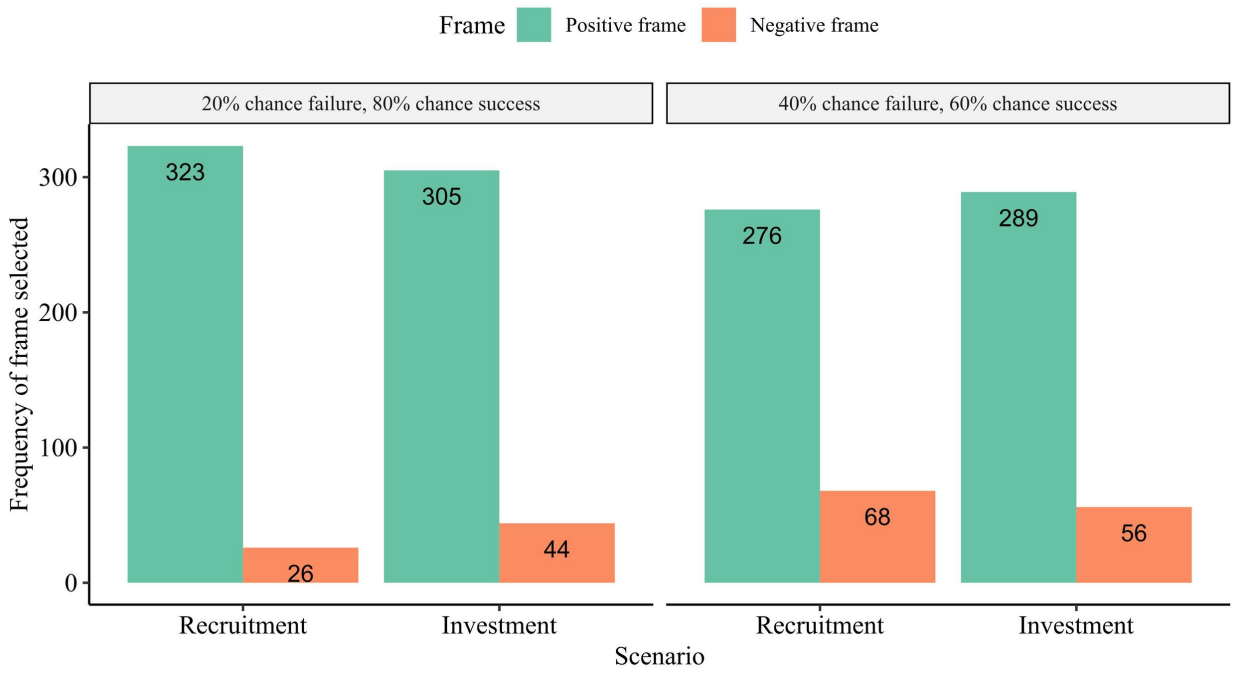

Figure 1. Total number of negative and positive frames selected in each condition and scenario (Study 1)

Table 2. Summary of hierarchical linear regression model predicting frame preference (Study 1)

	Model 1		Model 2		Model 3	
Predictors	*Estimates*	*CI*	*Estimates*	*CI*	*Estimates*	*CI*
Intercept	3.40 **	3.16 – 3.65	3.40 **	3.16 – 3.65	3.41 **	3.16 – 3.65
Chance	-0.92 **	-1.27 – -0.57	-0.91 **	-1.27 – -0.56	-0.91 **	-1.26 – -0.56
Worry			-0.07	-0.26 – 0.12	0.16	-0.11 – 0.44
Anger			0.06	-0.12 – 0.25	-0.19	-0.45 – 0.07
Worry× Chance					-0.44 *	-0.81 – -0.07
Anger× Chance					0.49 **	0.12 – 0.86
Observations	700		700		700	
R^2 / R^2 adjusted	0.036 / 0.035		0.037 / 0.033		0.050 / 0.043	

Note. Chance (0 = 20% chance failure, 80% chance success, 1 = 40% chance failure, 60% chance success). * $p < 0.05$. ** $p < 0.01$.

to certainty and control. It seems logical that participants might have perceived the 40/60 likelihood as more ambiguous compared to 20/80. Indeed, preference for positive frames was higher in the 20/80 condition.

Study 2

Building upon the results of our first study, we changed the chances of success and failure to make the decision more ambiguous in Study 2. In one condition, we used 50% chance of failure and 50% chance of success. In the other condition, we used 60% chance of failure and 40% chance of success. Both conditions should be equally or more ambiguous than the 40% chance of failure/60% chance of success condition in Study 1. We included additional preregistered measures that can be found in the supplementary file. The Study 2 preregistration can be accessed here: https://osf.io/5w24n.

Methods

Participants

A total of 650 participants were recruited from Prolific (321 males, 322 females, seven other/prefer not to answer; M_{age} = 40.11, SD_{age} = 14.80). We used the same prescreens as in Study 1. Participants were paid £1.38 for the roughly 11-minutes long study. As per the preregistration, we report our results using the complete dataset. Excluding participants (same criteria as in Study 1) did not change the results. We estimated the sample size using the same a-priori

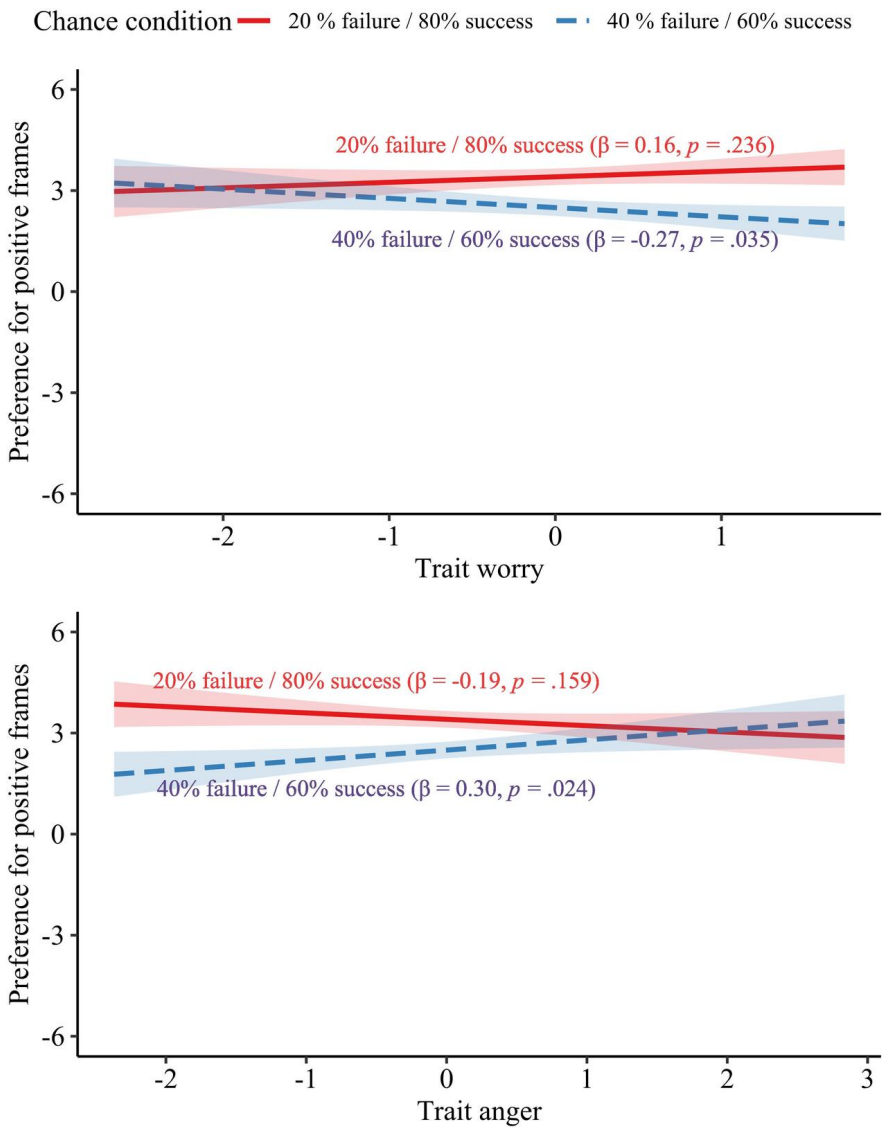

Figure 2. Interaction between trait worry and chance condition (upper panel) and interaction between trait anger and chance condition (lower panel) (Study 1)

power analysis as in Study 1 (using GPower 3.1.9.4; Faul et al., 2007).

Design and Procedure

The design and procedure were identical to Study 1, with the exception of the chances of failure/success that were shown in the two scenarios measuring frame preference. Participants were told that an applicant or medical treatment had a 50% chance of failure/50% chance of success in one condition and 60% chance of failure/40% chance of success in the other condition.

Measures

We used the same frame selection task, with the same questions about risk perception and willingness to recommend, and the same measures of trait worry (α = .96) and trait anger (α = .88) as in Study 1.

Results

Descriptives

Bivariate correlations among the key variables are shown in Table 3.

Neither trait worry nor trait anger correlated significantly with frame preference. Trait worry was positively correlated with risk perception across the recruitment and medical scenarios (r = .09*), suggesting that worried people perceived higher risk in these decisions. Consistent with Study 1, risk perception was negatively correlated with frame preference (r = -.32**), while willingness to recommend was positively correlated with frame preference (r = .51**).

Chance condition (0 = 50% fail, 50% success, 1 = 60% fail, 40% success) was negatively correlated with frame preference (r = -.10**), indicating that participants who were told that the job applicant and medical treatment had a higher

Table 3. Means, standard deviations, and correlations (Study 2)

Variable	*M*	*SD*	1	2	3	4	5
1. FP	1.56	2.50					
2. Worry	3.90	0.94	-.06				
3. Anger	3.51	1.10	-.04	.43**			
4. Chance	0.50	0.50	-.10**	-.01	-.05		
5. RP	4.41	0.98	-.32**	.09*	.04	.12**	
6. WR	4.06	1.04	.51**	-.04	-.02	-.20**	-.57**

Note. *M* and *SD* are used to represent mean and standard deviation, respectively. FP = preference for positive over negative frame, Chance (0 = 50% chance failure, 50% chance success, 1 = 60% chance failure, 40% chance success), RP = risk perception, WR = willingness to recommend decisions. * $p < .05$. ** $p < .01$.

chance of failure (60% instead of 50%) showed a weaker preference for positive frames. Participants in this condition also perceived higher risk ($r = .12^{**}$) and were less willing to make recommendations ($r = -.20^{**}$).

Preference for positive framing was significantly higher in the 50/50 condition ($M = 1.82$, SD = 2.37) compared to the 60/40 condition ($M = 1.31$, $SD = 1.61$), $t(648) = 2.62$, $p < .01$, $d = 0.21$, 95% CI [0.05, 0.36]. Figure 3 shows the average preference for positive framing in each condition and scenario in both Study 1 and Study 2.

Overall, and consistent with the pilot study and Study 1, a large majority of participants selected the positive frame, regardless of the condition (Figure 4).

Hypothesis Testing

A hierarchical linear regression model was fitted in RStudio (RStudio Team, 2022), with frame preference as the outcome variable and chance condition (50% chance failure/50% chance success vs 60% chance failure/40% chance success), trait worry, and trait anger as predictors.[4] Continuous predictors were standardized.

Contrary to our predicted main associations, neither worry nor anger predicted frame preference, and both were in the same direction (trait worry: β = -0.13, $p = .235$ (two-tailed), 95% CI = -0.34, 0.08; trait anger: β = -0.05, $p = .620$ (two-tailed), 95% CI = -0.27, 0.16). Chance condition (0 = 50/50, 1 = 60/40) was negatively associated with frame preference, β = -0.52, $p < .01$ (two-tailed), 95% CI [-0.90, -0.14]. The overall model was significant, $F(3, 646) = 3.17$, $p = .024$, $R^2 = .015$.

We ran the same exploratory analysis as in Study 2 to examine whether the chance condition moderated the predicted associations. However, there was no significant moderation by chance condition (trait worry × chance: β = -0.16, $p = .466$ (two-tailed), 95% CI = -0.58, 0.27; trait anger × chance: β = -0.19, $p = .369$ (two-tailed), 95% CI = -0.62, 0.23).

Interim Discussion

Overall, we found little evidence for our hypothesized associations between trait worry and frame preference and trait anger and frame preference. In Study 1, these associations only emerged among participants who read that there was a 40% chance of failure and 60% chance of success (vs 20% chance of failure and 80% chance of success). We proposed that this might be due to the higher ambiguity when chances were more even. However, when we attempted to replicate these findings with similarly ambiguous situations in Study 2, we did not find a similar pattern of results. This casts doubts on the robustness of the findings in Study 1. Next, we combined the data from our two studies to further investigate whether emotions predicted frame preference.

Exploratory Analysis—Combining Datasets from Study 1 and Study 2[5]

Apart from the chances of failure/success, the two studies were identical in design and measurements. Combining the datasets from the studies increases the statistical power to detect any associations between frame preference and trait worry and anger. We ran a linear mixed model using the *lme4* (Bates et al., 2014) package in RStudio that included random intercepts for subjects, study, and scenario. We treated frame preference as a repeated within-subjects measure (two levels: recruitment scenario and medical investment scenario). Trait worry and trait anger were included as predictors.[6] Although the associations between frame preference and trait worry and trait anger go in the

4 As in Study 1, we also ran two separate regression models to test each trait emotion variable without controlling for the other. Both coefficients were insignificant (trait worry: β = -0.15, $p = .122$, 95% CI = -0.34, 0.05; trait anger: β = -0.10, $p = .327$, 95% CI = -0.29, 0.10). Chance condition was the only significant predictor, β = -0.51, $p = .009$ (two-tailed), 95% CI [-0.90, -0.13].

5 Results from separate analyses of Study 1 and Study 2 using linear mixed effects modeling predicting the continuous Frame Preference variable, and using logistic mixed effects modeling predicting the binary Choice variable can be found in the supplement.

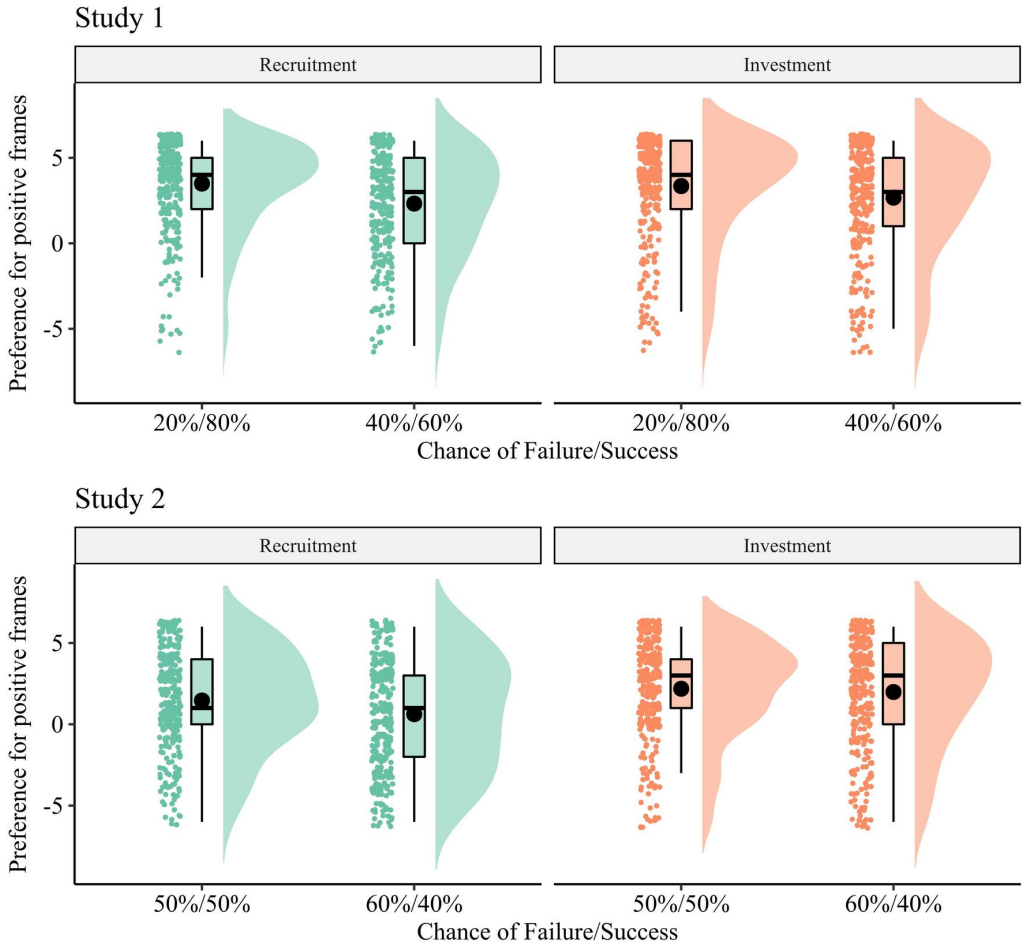

Figure 3. Frame preference in each scenario and chance condition in Study 1 (upper panel) and Study 2 (lower panel)

Note. Colored fields display the distribution of responses. Boxplots display the median, first, and third quartiles. Black circles denote mean values.

predicted directions (worry: β = -0.10, p = .156 (two-tailed), 95% CI = -0.24, 0.04; anger: β = 0.01, p = .920 (two-tailed), 95% CI = -0.13, 0.15), they are not statistically significant.

We also tested the same model with the binary frame selection variable (0 = negative frame, 1 = positive frame) in a logistic mixed model. The association between trait worry and frame selection was negative and significant (β = -0.14, p = .012 (two-tailed), 95% CI = -0.25, -0.03). The association between trait anger and frame selection was not significant (β = 0.01, p = .802 (two-tailed), 95% CI = -0.09, 0.12). Taken together, we find some evidence for an effect of worry but not anger.

Equivalence Testing[7]

The null results for the continuous measure of frame preference may reflect very small associations rather than an absence of associations. To test this possibility, we used the two one-sided tests of significance procedure (TOST; Lakens et al., 2018). We set the smallest effect size of interest at r = 0.1, which corresponds to a very small effect (Funder & Ozer, 2019). Non-significant p-values indicate the observed correlation is outside the boundary of −0.10–0.10 and may be potentially meaningful. The correlations between trait worry and frame preference and trait anger and frame preference were significantly higher than the lower SESOI (ps < .001) and significantly lower than the higher SESOI (ps < .001), suggesting that these associations may not be meaningful. Plots of the results of the equivalence tests can be found in the supplementary file.

6 We ran a linear mixed model to examine whether risk perception and willingness to recommend were stronger predictors of frame preference than trait worry and anger (see supplementary file).

7 We also estimated the focal correlations (and their 95% CI) across the different between- and within-subjects conditions and summarized them in an internal meta-analysis (see supplementary file).

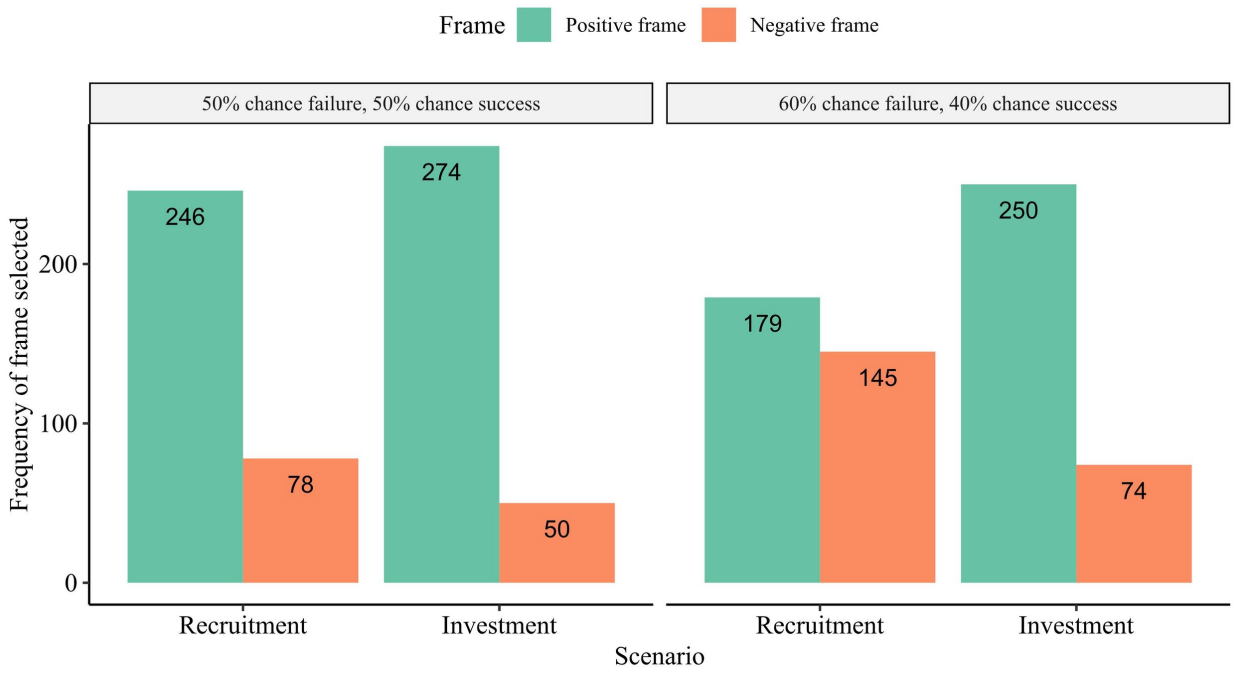

Figure 4. Total number of negative and positive frames selected in each condition and scenario (Study 2)

Exploring the Moderating Role of Risk Perception

Although the results from equivalence testing suggest non-meaningful associations, it is possible that our study was not conducive to the proposed influence of worry and anger on frame preference. According to the appraisal tendency framework's "matching principle" (Han et al., 2007; Lerner et al., 2015), for such influences to occur, the appraisals underlying the emotions must map onto the decision itself. Thus, if worry and anger are to influence frame selection, the appraisals of certainty and control must somehow be involved.

To test this possibility, we explored whether the influence of fear and anger on frame preference were moderated by risk perception, which we considered a proxy for perceived uncertainty. One might expect that the associations would be more likely to appear among those who perceived high risk (i.e., for whom the appraisal of uncertainty was most relevant). We extended the first linear mixed model by adding the trait worry × risk perception interaction term and the trait anger × risk perception interaction term as predictors. All variables were standardized. The results from both models are shown in Table 4.

Both trait worry and trait anger significantly interacted with risk perception (trait worry × risk perception: β = -0.13, p = .037 (two-tailed), 95% CI = -0.25, -0.01; trait anger × risk perception: β = 0.13, p = .035 (two-tailed), 95% CI = 0.01, 0.25). The interactions are illustrated in Figure 5. Simple slopes analysis indicated that the association between trait worry and frame preference was negative and significant among those who perceived high risk (β = -0.21, p = .029) and positive and insignificant among those who perceived low risk (β = 0.06, p = .551). The association between trait anger and frame preference was positive and insignificant among those who perceived high risk (β = 0.18, p = .056) and negative and insignificant among those who perceived low risk (β = -0.08, p = .366). Overall, both due to their exploratory nature and due to the difficulty of interpreting findings with p-values just below the .05 threshold (Lakens, 2015), these results should be taken as highly tentative.

Mediation Analysis Exploring the Indirect Effect of Chance Condition on Frame Preference

Finally, given that risk and willingness to recommend were strongly related to frame preference in both studies, we examined whether these two variables mediated the effect of chance condition on frame preference. First, we examined how frame preference varied across all four chance conditions across Study 1 and Study 2. There was a total of four chance conditions, coded as follows: 1 = 60% chance failure, 40% chance success, 2 = 50% chance failure, 50% chance success, 3 = 40% chance failure, 60% chance success, 4 = 20% chance failure, 80% chance success, i.e., higher numbers indicate a higher chance of success. An ANOVA indicated a significant effect of chance condition on frame preference, $F(3, 1346) = 47.41$, $p < 0.001$, $\eta^2_p = 0.096$. Contrast analysis indicated that all groups were significantly different from each other, with a stronger preference for positive frames as the chances of success increased.

Next, we used the PROCESS macro for R (Hayes, 2017) (model 6) to test a serial mediation model. Five thousand bootstrap samples were used to estimate the indirect effect, which is significant when the 95% confidence intervals do not include zero. There was a significant indirect effect of chance condition on frame preference through risk perception and willingness to recommend decisions. See Figure 6.

Table 4. Summary of the linear mixed model predicting frame preference (Study 1 and 2 combined)

	Model 1		Model 2	
Predictors	*Estimates*	*CI*	*Estimates*	*CI*
(Intercept)	2.26 **	0.79 – 3.72	2.27 **	1.49 – 3.05
Worry	-0.10	-0.24 – 0.04	-0.08	-0.21 – 0.06
Anger	0.01	-0.13 – 0.15	0.05	-0.09 – 0.18
RP			-1.19 **	-1.31 – -1.08
Worry×RP			-0.13 *	-0.25 – -0.01
Anger×RP			0.13 *	0.01 – 0.25
Random Effects				
σ^2	7.29		6.02	
τ_{00}	2.24 $_{\text{Subject}}$		2.50 $_{\text{Subject}}$	
	0.26 $_{\text{Chance condition}}$		0.01 $_{\text{Chance condition}}$	
	0.84 $_{\text{Study}}$		0.19 $_{\text{Study}}$	
	0.14 $_{\text{Scenario}}$		0.12 $_{\text{Scenario}}$	
ICC	0.32		0.32	
N	1350 $_{\text{Subject}}$		1350 $_{\text{Subject}}$	
	2 $_{\text{Scenario}}$		2 $_{\text{Scenario}}$	
	2 $_{\text{Study}}$		2 $_{\text{Study}}$	
	4 $_{\text{Chance condition}}$		4 $_{\text{Chance condition}}$	
Observations	2700		2700	
Marginal R^2 / Conditional R^2	0.001 / 0.324		0.142 / 0.415	

Note. * $p < 0.05$. ** $p < 0.01$.

Discussion

Neither trait worry nor trait anger predicted preference for positive framing in Study 2. In contrast to our exploratory findings in Study 1, these associations were not moderated by chance condition. Thus, we found no support for our preregistered hypotheses. However, we found several results worth highlighting in our exploratory analyses combining the datasets from Study 1 and 2.

First, preference for positive frames increased in conditions with greater chances of success. Second, this effect seemed to occur indirectly through risk perception and willingness to recommend the decisions. Third, we found some evidence that the relationship between trait worry and anger and frame preference may be moderated by risk perception. Among those who perceived the decisions to be high risk, the preference for positive frames decreased as trait worry increased, while it (non-significantly) increased as trait anger increased. This could be interpreted as consistent with the appraisal tendency framework, which has shown that fear—an emotion characterized by uncertainty—is associated with high risk perception and risk aversion, whereas anger—an emotion characterized by high certainty—is associated with low risk perception and risk seeking. Our exploratory findings open the possibility that fear and anger may influence frame selection in opposite ways, but only when speakers perceive high risk.

General Discussion

The vast majority of studies on framing investigate the effect of a given frame on decision making and judgments. But people do not always receive external frames; they form their own and communicate these frames to others. Building on a small number of studies that have investigated how various factors influence speakers' choice of frame, the current study examined how individual differences in worry and anger influence preference for positive over negative framing in an attribute framing task. Drawing on the appraisal tendency framework (Lerner et al., 2015; Lerner & Keltner, 2000, 2001), we hypothesized that worry would be negatively and anger positively associated with a preference for positive frames.

Overall, across two preregistered and well-powered studies, we found little evidence for our hypotheses. Exploratory analyses indicated that the associations emerged in one of the chance conditions in Study 1 (when outcomes were described as having a 40% chance of failure/60% chance of success). We proposed that this was due to the higher ambiguity in this specific condition (compared to 20% chance of failure and 80% chance of success). However, we failed to replicate this finding using equally or more ambiguous chances in Study 2. Analyzing the combined dataset for both studies also did not show any clear effects of worry and anger on frame selection when using the continuous measure of frame preference. Still, it did show the predicted effect of worry with a dichotomous dependent variable (i.e., choosing the success vs failure frame). Over-

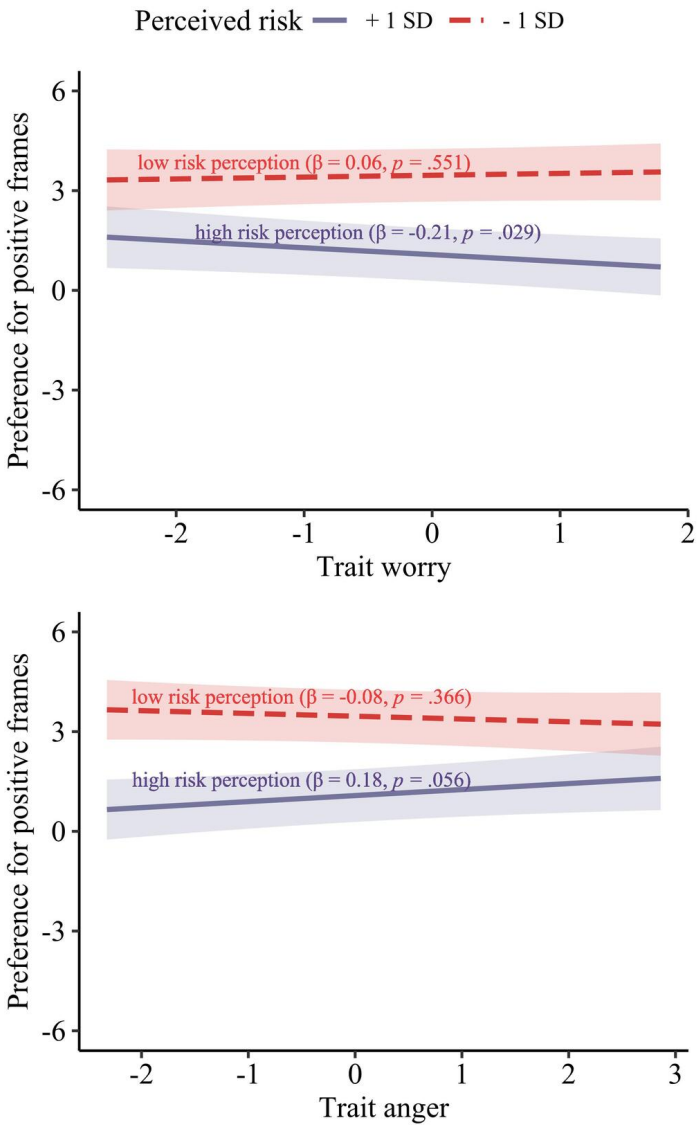

Figure 5. Interaction between trait worry and risk perception (upper panel) and interaction between trait anger and risk perception (lower panel) (Study 1 and Study 2 combined)

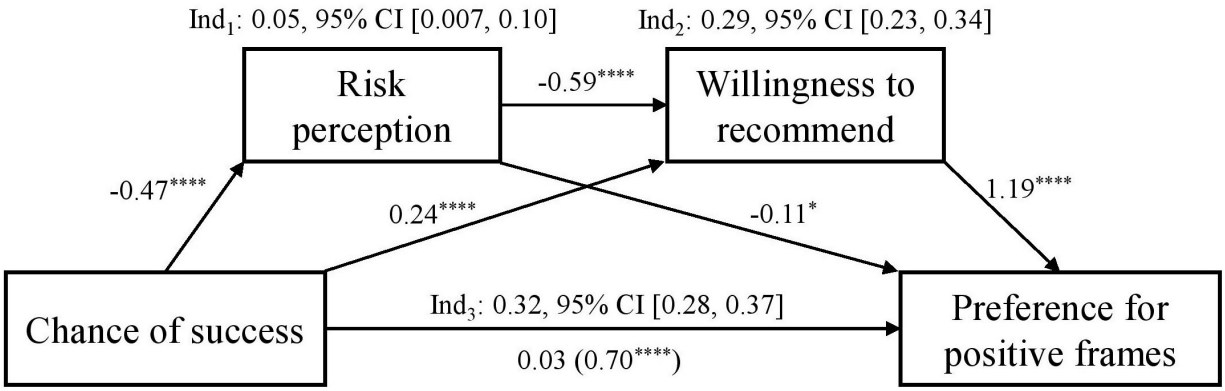

Figure 6. Serial mediation model testing the indirect effect of chance of success on frame preference via risk perception and willingness to recommend (Study 1 and Study 2 combined)

Note. Numbers represent unstandardized regression coefficients. * $p < .05$ **** $p < .0001$. Ind_1 = indirect effect via risk perception, Ind_2 = indirect effect via willingness to recommend, Ind_3 = serial indirect effect via risk perception and willingness to recommend.

all, the main results do not give much support to our hypotheses.

Our null findings concerning the predicted main association between trait emotions and frame preference diverge from a small number of studies that have examined how various individual factors predict frame preference. Peng et al. (2014) found that individuals with high levels of trait anxiety used more negative words to construct frames. Other studies have found that those who score higher on optimism—a characteristic of angry people (Lerner & Tiedens, 2006)—are more likely to use positive words to frame a decision problem (e.g., lives saved), while pessimistic people are more likely to use negative frames (e.g., lives lost) (Yu et al., 2015; Zhang et al., 2020).

There are several possible explanations for the null findings observed in the current study. First, the discrepancy between our findings and those in previous studies may be due to a difference in study design. While previous studies (e.g., Peng et al., 2014, 2019; Wang, 2004; Yu et al., 2015; Zhang et al., 2020) have used a framing task where participants can select frames by completing sentences by filling in words of their own choice (e.g., "save", "die", "survive"), participants in our studies made a binary choice between two preselected options, namely success vs failure. Our task may have facilitated the comparison between positive and negative frames to a larger extent than in previous studies, making this a more cognitive task with relatively little room for the influence of emotions (similar to "cold" vs "hot" tasks, Figner et al., 2009).

Another possibility is that the appraisal tendency framework is not an appropriate tool for predicting emotional effects on frame selection. The appraisal tendency framework proposes that worry and anger lead to opposite judgments and decisions involving risk and uncertainty because these two emotions are highly differentiated in appraisals of certainty and control. However, for discrete emotional effects to emerge, the decision at hand must share the same appraisal theme as the target emotions (see the "matching constraint" principle discussed in Han et al., 2007). That is, worry and anger should mainly influence decisions associated with uncertainty and control, such as those involving risk. It is possible that our studies did not achieve such a match. However, we found it plausible before running the studies that the process of selecting between different frames would involve an emotional evaluation of the different frames. Those more disposed to worry would presumably attend more to the negative information and communicate this to others, while those more disposed to anger would be more willing to ignore possible negative outcomes.

To test whether the null findings might depend on participants' perceived uncertainty in the scenarios, we combined the data from both studies to examine whether our hypothesized influence of trait worry and trait anger on frame preference only emerged among those who perceived high risk (a proxy for perceived uncertainty). Supporting this speculation, we found that the hypothesized associations only emerged among participants who perceived high risk. However, given that these tests were exploratory, we see these findings as preliminary and in need of further investigation. Assuming the hypothesized effects of incidental fear and anger on frame preference exists, future studies may be able to detect such effects using tasks that more strongly induce perceptions of uncertainty.

On a similar note, familiarity with the scenarios might have reduced the extent to which the scenarios aroused participants emotionally. Nabi (2003) found that fear and anger led to opposite effects on information preference but only when the topic concerned an unfamiliar (i.e., ambiguous) topic. Although we developed our own scenarios, which should help address the issue of familiarity to some extent, our sample consisted of Prolific users who are presumably very familiar with these types of scenarios.

It is also possible that emotional effects on judgments and decisions are more variable. A recent meta-analysis by Bartholomeyczik et al. (2022) found no significant differences between the effects of fear and anger on decision making under risk and uncertainty. Bartholomeyczik and colleagues also found large heterogeneity in effects (comparisons of discrete emotions included anger/fear, anger/sadness, and fear/sadness) which could not be explained by various task characteristics. Similarly, another meta-analysis by Ferrer and Ellis (2021) compared the influence of incidental and integral fear and anger on risk perception. Contradicting the appraisal tendency framework, the meta-analysis found that anger influenced risk-related judgments in opposite directions depending on whether anger was integral or incidental. For fear, the effects were in the same direction, although the effect of incidental fear was not significant. Moreover, Mayiwar and Björklund (2021) conducted three preregistered studies examining the influence of trait and manipulated fear/worry and anger on risk seeking. Neither fear nor anger predicted risk seeking alone. There was, however, a significant and negative association between dispositional fear and risk seeking at low levels of emotion regulation.

Pietruska and Armony (2013) found no evidence of a main association between trait anger and risk taking and only some evidence of a positive relationship between trait anger and optimism. Thus, it is possible that, overall, the effect of fear on judgment and decision making is more consistent than the effect of anger, at least in the risk domain. Our internal meta-analysis also indicated that the association between trait anger and frame preference varied more than the association between trait worry and frame preference. Combined with the null findings in the current study, one suggestion for future research is to focus on fear—particularly integral fear.

Although the exploratory equivalence tests indicated that associations larger than $r = .10$ could be rejected, we also examined the 90% CI of the focal associations in Study 1 and Study 2 to estimate the largest possible association consistent with our hypothesis. According to a recent meta-analysis of effect sizes in individual differences research, correlations of .10, .20, and .30 can be considered relatively small, medium, and large, respectively (Gignac & Szodorai, 2016). We used these benchmarks to assess the size of the associations. The largest possible association between trait

worry and frame preference ranged from medium to large. The largest possible association between trait anger and frame preference was medium in the first study and in the opposite direction in the second study. If these optimistic estimates are true, then the association between trait worry and frame preference may be practically meaningful. However, we see this as a very optimistic estimate. A meta-analysis of the effect of fear on risk taking found a small to moderate average effect size (r = 0.22), although with considerable heterogeneity in effect sizes, some of which were in the opposite direction (Wake et al., 2020).

While our hypothesized link between trait emotions and frame preference received little support, other variables emerged as robust predictors of frame preference. A series of exploratory analyses revealed three key insights, which we believe are quite important given the relative sparsity of systematic studies of frame selection. First, the manipulation of chances of failure and success predicted frame preference in both studies, with the preference for positive frames increasing as the chance of success increased. This is in line with studies showing that speakers select the frame that is consistent with the largest component (Pander Maat et al., 2021).

Second, we measured individuals' perception of how risky it was to actually hire the applicant or invest in the medical treatment and their willingness to recommend the job applicant and medical investment. Risk perception was negatively and willingness to recommend positively associated with preference for positive frames. This can be seen as consistent with integral emotions playing a role. Risk perception and willingness to recommend arguably reflect idiosyncratic affective responses to the scenario, which are again reflected in the frames that people prefer. In that way, a frame can be said to reveal an individual's affective response but not necessarily their emotional disposition.

Third, chance of success was positively and indirectly related to frame preference serially through risk perception and willingness to recommend. As chances of success increased, individuals perceived lower risk, which in turn was linked to a stronger willingness to recommend the decisions, which finally predicted a preference for positive framing.

Finally, across both studies and the pilot study, a large majority of participants preferred positive frames. This is in line with previous research (e.g., Keren, 2007; van Buiten & Keren, 2009; Wang, 2004). There are several possible explanations for this finding. One explanation has to do with how speakers wish to portray themselves. People might believe that it is more socially acceptable to express oneself positively. Relatedly, the literature suggests that people typically approach decisions by focusing on achieving goals. In our experiments, participants may have viewed the recruitment and medical investment scenarios as opportunities that fulfill organizational goals.

Another factor likely contributing to the predominance of positive frames is the so-called markedness differences between the failure and success frames (Pander Maat et al., 2021). "Chances of success" is unmarked, whereas "chances of failure" is marked, meaning that using the success frame is more "neutral" than using the failure frame, which is a clear negative signal. Pander Maat and colleagues (2021) showed that markedness influences frame selection, with a stronger preference for "unmarked" descriptions. Dutton and Jackson (1987) introduced a similar proposition, suggesting that negative labels signal the need for actions of larger magnitudes:

> "When an organisation's decision makers label a strategic issue a threat, they are likely to construct an organisational response that includes taking actions of large magnitude. In contrast, when an organisation's decision makers label a strategic issue an opportunity, they are more likely to construct an organisational response that includes actions smaller of magnitude" (p. 84).

The fact that a majority chose the "success" frame, even when the chance of failure was 60%, has implications for the debate about the effects of framing on judgments and decisions (e.g., Teigen, 2015). If we intuitively know that the "failure" frame (or, more generally, negative frames) is rarely used, we might assume that someone who uses that frame has a good reason for it. Thus, in line with the information leakage perspective (Sher & McKenzie, 2006), framing effects may show that people are sensitive to the cues provided by the speaker and not that they are irrational in having opposite reactions to logically equivalent statements.

Conclusion

A well-established finding in the judgment and decision-making literature is that people's decisions are sensitive to how options are described to them. The current study explored how *speakers* frame outcomes when communicating information to listeners. Drawing on appraisal theories of emotion, we proposed that worry—an emotion associated with uncertainty—would increase preference for negative framing, whereas anger—an emotion associated with certainty—would increase preference for positive framing. Overall, we failed to find support for these predictions, and based on our preregistered analyses, we must conclude that these two emotions seem to have little influence on frame selection for the task used in the current studies. Our exploratory analyses provide some suggestive evidence that worry and anger could be related to frame selection among participants who perceived high risk. Still, this finding should be taken as tentative and needs to be replicated in future studies. Further research should also consider investigating integral emotions rather than trait or incidental emotions. The finding that risk perception and willingness to recommend a decision were strongly related to frame preference indicates that speakers reveal more about such in-the-moment affective responses than about their trait emotions through the frames that they choose.

Contributions

We used the CRediT (Contributor Roles Taxonomy) to identify the contribution and roles played by the contributors in the current study. Please refer to the URL (https://www.casrai.org/credit.html) for details and definitions of each of the roles listed below.

Role	Lewend Mayiwar	Erik Løhre
Conceptualization		x
Data curation	x	
Formal analysis	x	
Funding acquisition	x	
Investigation	x	x
Methodology	x	x
Project administration	x	
Resources	x	
Software	x	
Supervision	x	x
Validation	x	x
Visualization	x	
Writing – original draft	x	
Writing – review & editing	x	x

Competing Interests

The authors declare no competing interests.

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Data Accessibility Statement

All preregistrations, data, code, and supplementary materials from the current research are available via the Open Science Framework: https://osf.io/3e98a/.

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