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Effects of induced moods on economic choices

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Abstract

Emotions can shape decision processes by altering valuation signals, risk perception, and strategic orientation. Although multiple theories posit a role for affective processes in mediating the influence of frames on decision making, empirical studies have yet to demonstrate that manipulated affect modulates framing phenomena. The present study asked whether induced affective states alter gambling propensity and the influence of frames on decision making. In a between-subjects design, we induced mood (happy, sad, or neutral) in subjects (N=91) via films that were interleaved with the framing task. Happy mood induction increased gambling and apparently accentuated framing effects compared to sad mood induction, although the effect on framing could have resulted from the fact that the increased tendency to gamble made the framing measure more sensitive. Happy mood induction increased gambling, but not framing magnitude, compared to neutral mood induction. Subjects experiencing a sad mood induction did not exhibit behavioral differences from those experiencing a neutral mood. For those subjects who experienced the happy mood induction, both gambling propensity and framing magnitude were positively correlated with the magnitude of the change in their mood valence. We discuss the broader implications of mood effects on real-world economic decisions.

Keywords: decision making, risk, behavioral economics, framing, affect, mood, emotion.

1 Introduction

In the first quarter of 2012, more than 30% of residential mortgages in the United States had balances greater than the value of the mortgaged property (Zillow, 2012). Generally, homeowners face two mortgage options: a fixed interest rate that remains constant for the lifetime of the loan or a variable interest rate that fluctuates over the course of the loan. When contemplating this choice, homeowners may feel tempted to gamble on an adjustable rate mortgage, which commonly has a lower rate at inception than alternate fixed rates, but which may result in higher rates in the future. During the deliberation of this decision, many factors likely contribute to an individual's choice—aspects of decision architecture as well as psychological states. Economic decisions of this magnitude do not occur in an emotional vacuum.

Several decision theories in behavioral economics indicate that the manner in which a decision is framed alters choices (Tversky & Kahneman, 1974, 1981). In particular, presenting options as losses (versus gains) from a reference point promotes enhanced risk taking. Framing effects extend beyond the laboratory to real-world decision making in several domains, including patients' decisions regarding medical treatment (Armstrong, Schwartz, Fitzgerald, Putt, & Ubel, 2002). Indeed, the framing of the decision to initiate social security benefits prior to full benefit eligibility as either the loss of an initial monthly income stream by claiming later or the gain of a significantly increased monthly benefit by claiming later strongly predicts the intended age of benefit initiation (Brown, Kapteyn, & Mitchell, 2011). As framing effects can drive significant economic and personal decisions, an understanding of the underlying cognitive and affective mechanisms that affect them has the potential to enrich decision theories.

Evidence from multiple demonstrations suggests, but has failed to verify, that affective processes mediate the impact of frames on decisions. In the initial demonstration of the framing effect, Kahnemam and Tversky (1981) suggested that altering emotional reactions would modulate framing effects. Others have since extended this assertion by arguing that framing may be akin to an affective heuristic, by which initial emotional appraisals shape choices (Slovic, Finucane, Peters, & MacGregor, 2002). Consistent with these theoretical positions, evidence from neuroimaging shows that decision frames evoke neural activity in brain areas associated with affective processes,

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which further implicates affective states as a mechanism through which frames influence decisions (De Martino, Kumaran, Seymour, & Dolan, 2006). Despite this theoretical consensus that emotion is key to framing effects, the specific mechanisms through which affective signals influence framing effects have not been well characterized.

Just as framing contexts alter choice, affective contexts shape economic decisions, both in the laboratory and the real-world (Elster, 1998; Loewenstein, 1996; Loewenstein, Weber, Hsee, & Welch, 2001). Stock market returns are positively correlated with morning sunshine in the city of the stock exchange (Hirshleifer & Shumway, 2003), presumably due to sunshine's beneficial impact on mood, and seasonal affective disorder has been associated with stock market performance around the world (Kamstra, Kramer, & Levi, 2003). These examples are striking primarily because the emotions involved are not generated by factors directly germane to the choice being considered, but rather spurious circumstances surrounding the decision. That is, the affective state is incidental instead of integral to the options at hand (Loewenstein & Lerner, 2003). Evidence from laboratory experiments also supports a role for incidental affect in shaping decision processes. Individuals often interpret experienced affective states as relevant to ongoing mental processes (Clore, Gasper, & Garvin, 2001), providing an avenue for incidental emotions to color decision preferences.

Several core theories detail the role that incidental affective states play in decision making. One of the most influential is the Appraisal Tendency Framework (Han, Lerner, & Keltner, 2007; Lerner & Keltner, 2000, 2001). This theoretical perspective emphasizes the fact that various emotional states also evoke certain cognitive styles and appraisals (Lazarus, 1991; Smith & Ellsworth, 1985), and these appraisals will then shape how people integrate information and prioritize different outcomes. For instance, sadness can make information about losses more salient (Lazarus, 1991), and thus cause individuals to pursue actions to avoid or replace losses. Appraisals may also motivate individuals to seek ways to alter their current mood if they find it undesirable, or to maintain their mood if it is pleasant. The Affect as Information hypothesis also emphasizes the cognitive effect of mood states, highlighting that current emotional states will alter evaluative judgments of objects in the environment (Schwartz & Clore, 1983). For example, a positive mood will cause people to evaluate other things they encounter or thoughts they have more positively, which would promote optimistic forecasting for future events. Such positive evaluations may in turn lead to enhanced risk-seeking behavior.

As framing effects are putatively driven by affective signals, the question arises whether incidental mood states, unrelated to the present decision, moderate gain/loss framing effects? Two relevant mood states are happiness and sadness, which differ not only in terms of their pleasantness but also with respect to the cognitive appraisals each evokes. The Appraisal Tendency Framework would emphasize the role of differing cognitive appraisals. Sadness may increase the desire to improve mood when it is negative, leading people to pursue higher risk options that are more likely to reduce negative mood when outcomes are framed as losses (Lerner, Small, & Loewenstein, 2004; Raghunathan & Pham, 1999), leading to larger framing effects for sad individuals compared to those in a neutral mood.

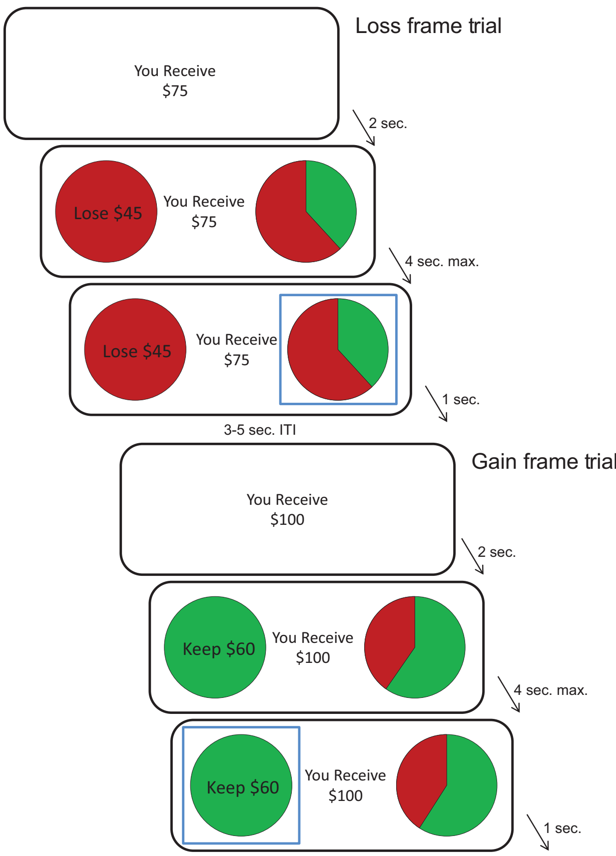
On the other hand, happiness may make individuals optimistic about their chance of winning gambles and generally less likely to engage in deep or effortful cognitive processing (Tiedens & Linton, 2001). This pattern of behavior would thus also produce larger framing effects for happy individuals compared to those in a neutral mood. This hypothesis aligns with predictions from the Affect as Information position, which suggests positive moods like happiness should promote simpler processing (Loewenstein, Weber, Hsee, & Welch, 2001; Schwartz, Bless, & Bohner, 1991).

Conversely, positions that posit a role for positive affect in promoting more efficient and adaptive cognitive processing would instead highlight the role of positive affect in prompting accuracy or more elaborative thinking (Isen, Rosenzweig, & Young, 1991; Wegener, Smith, & Petty, 1995). Thus, these theories would predict that positive moods like happiness should reduce reliance on heuristics and diminish observed framing effects. This position is concordant with a previous investigation, which reported that distress increased the magnitude of observed framing effects whereas happiness reduced observed framing effects (Druckman & McDermott, 2008). Yet, while Druckman & McDermott (2008) used correlational techniques and also manipulated emotions (distress, anger, & enthusiasm) in their studies, they did not include a neutral condition as a reference point, and the decisions employed were hypothetical.

The present experiment investigated the influence of incidental affect on individuals' economic decisions in an incentive-compatible framing task. In a between-subjects paradigm that interleaved mood inductions via film clips with the framing task, the present experiment evaluated the differential effects of sadness and happiness on decision making. Subjects made decisions between monetary gambles that were either framed as gains or losses from a reference point (Figure 1). We compared gambling rates and framing effects in sad, happy, and neutral mood states. In addition, we tested the hypothesis that individuals who are most affected by the mood induction would show the largest mood-congruent shifts in their decision preferences.

Figure 1: Examples of two trials from the experimental design.

At the beginning of each trial, subjects are presented with a monetary endowment. Subjects must then choose between a certain outcome for that endowment or a risky one. In the certain option, they maintain a portion of the original endowment. In the risky option, they may play a gamble to determine whether they keep all of the endowment or lose all of the endowment. The probability of winning this gamble, and thus securing all of the initial endowment, is depicted graphically by the portion of the circle that is green. The critical difference between loss (top) and gain (bottom) frame trials lies in the presentation of the certain outcome, which can be presented as a guaranteed loss or gain of a portion of the initial endowment.



2 Method

2.1 Subjects

Subjects were run in an Experimental group and a Control group. The Experimental group consisted of the sad and happy mood induction subjects (N=65, Age *M*=22.2, *SD*=2.6; 35 women), who were randomly assigned. Then, a Control group of neutral mood induction subjects was recruited later (N=26, Age *M*=22.2, *SD*=3.7; 16 women). A single participant was screened out prior to participation due to a score greater than 20 on the Beck Depression Inventory, which is suggestive of depressive symptoms. Due to lack of compliance with mood rating instructions, one participant's rating data were excluded from all analyses.[1] The final sample was composed of 91 subjects. All subjects completed cognitive tasks on a second day, data from which are not reported here. Subjects were compensated at a base rate of $10, along with a monetary bonus (Experimental group *M*=$16.23, *SD*=$7.59; Control group *M*=$20.39, *SD*=$11.74) based on their choices in the task. Subjects were instructed that, upon completion of the experiment, two trials would be randomly chosen, resolved, and then multiplied by an undisclosed fraction to determine their monetary bonus, which ensured incentive compatibility.

2.2 Procedure

Subjects provided informed consent, completed the Beck Depression Inventory (Beck, Ward, Mendelson, Mock, & Erbaugh, 1961) for screening purposes, and completed a practice session of the economic decision-making task. They then completed four task blocks. Subjects began each block by rating both the valence (negative to positive) and the arousal (calm to excited) of their immediate affect using the 9-point Self-Assessment Manikins (Bradley & Lang, 1994). These two ratings were followed by a film clip intended to induce a happy mood, a sad mood, or no change in mood (neutral control) in a between-subjects design to minimize practice and carry-over effects. Film clips are an effective means of inducing affect in laboratory experiments (Gross & Levenson, 1995), and our use of multiple film clips to induce an affective state helped mitigate the influence of idiosyncratic factors related to any given clip (e.g., actor attractiveness) on measured outcomes. Emotional film clips were previously validated for efficacy and specificity (Wang, LaBar, & McCarthy, 2006), were 3–7 minutes long, and were taken from popular media (e.g., *I Love Lucy*, *Sophie's Choice*, etc.). Neutral film clips were also 3–7 minutes long and developed from popular media, such as documentaries and informational broadcasts (e.g. *Planet Earth*). After the clip, the participant rated the valence and arousal of their affect and then performed the decision-making task for approximately 4 minutes. These steps—mood rating, mood induction, mood rating, decision-making task—were repeated for each of the four test blocks within a session. All four film clips viewed by each participant evoked the same mood (i.e., happy, sad, or neutral) and were presented in an order randomized for each participant.

The decision-making task involved decisions between monetary gambles that were either framed as gains or as

[1]The exclusion of this subject's data does not substantively alter the reported results.

losses from a reference point (De Martino, Kumaran, Seymour, & Dolan, 2006; Tversky & Kahneman, 1981). On each trial, subjects were first presented with an endowment for 2 sec (e.g., "You Receive $75"). They were then given the choice of maintaining a guaranteed amount of this initial endowment or gambling that they would either win some amount or lose the entire endowment (Gamble option). The Certain option could be presented either as a gain, maintaining a portion of the initial endowment (e.g. "Keep $30"), or as a loss, forfeiting a portion of the endowment (e.g. "Lose $45"). Importantly, the gain-frame and loss-frame conditions have no objective differences, and thus any changes in behavior must be due to the subjective influence of changes in the reference point (Figure 1). The set of gambles was developed by crossing 4 endowment levels (Range: $25–$100 in $25 increments) with 4 potential probabilities of winning the gamble (Certain option, Range: 20%–80% in 20% increments). From this set, each possible gamble appeared twice in each framing context. On 64 of the 96 total gamble trials, the expected values of the gamble option and the value of the certain option were matched, while the frame ("Lose" vs. "Gain") of the certain option varied. On the remaining 32 trials, the expected value was biased in favor of either the gamble or the certain option (see Appendix for details).

Gamble presentation order was randomized for each participant, with the constraint that each of the four blocks of the task had an equal number of gain frame, loss frame, and expected value-biased trials. The options were presented for a maximum of 4 sec and terminated with subjects' response, followed by a variable intertrial fixation interval (range: 3–5 sec). No feedback about trial outcomes was presented to subjects during the session.

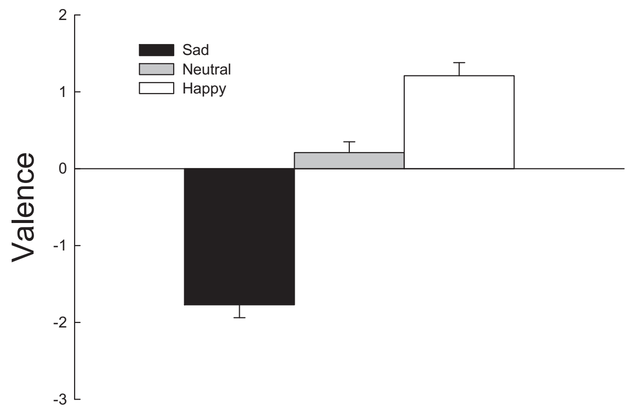
3 Results

3.1 Mood induction

To verify the efficacy of the mood inductions, we calculated the difference in subjects' post-film and pre-film valence and arousal ratings for each of the four films in each mood induction condition. These ratings were then averaged to create mean valence and arousal change scores for each participant. ANOVA showed that there was a significant main effect of group (happy, sad, neutral) on individuals' changes in valence, $F(2,87) = 88.49$, $p < .001$, $\eta^2 = .67$ (Figure 2). The effects of mood induction were all in the anticipated directions: Tukey's posthoc pairwise comparisons revealed that subjects in the happy mood induction showed positive valence changes that were significantly greater than both the sad, $p < .001$, and neutral groups, $p < .001$, and the subjects in the sad mood induction had negative valence changes that were significantly lower than the neutral subjects, $p < .001$ (Figure 2). Arousal ratings in-

Figure 2: Changes in mood following mood induction.

The mean mood valence changes as a function of the happy, sad, and neutral mood inductions are shown. Bars represent the standard error of the mean.



creased during the happy mood induction, $t(33) = 5.35$, $p < .001$, $d = 0.92$ (Preinduction $M = 4.3$, $SD = 1.4$; Postinduction $M = 5.1$, $SD = 1.4$), did not significantly change during the sad mood induction, $p > .1$ (Preinduction $M = 3.7$, $SD = 1.3$; Postinduction $M = 4.1$, $SD = 1.6$), and decreased during the neutral mood induction, $t(25) = 3.02$, $p = .006$, $d = 0.59$ (Preinduction $M = 3.7$, $SD = 1.5$; Postinduction $M = 3.2$, $SD = 1.7$). These patterns are consistent with dimensional models of emotion that characterize happiness as positively valent and high in arousal whereas sadness is negatively valent and low in arousal (Russell, 1980).

3.2 Impact of mood induction on gambling and framing effects

To investigate the impact of the mood induction on decision making, we first calculated the proportion of times subjects chose the gamble option instead of the certain option for trials framed as gains from a reference point (gain frame) and trials framed as losses from a reference point (loss frame). The "framing effect" is defined as the difference in the proportion of gambles accepted when framed as a loss minus the proportion of gambles accepted when framed as a gain. A repeated-measures ANOVA examined the within-subjects effect of frame (gain or loss) and the between-subjects effect of mood induction (happy, sad, or neutral) on the proportion of gambles chosen. Subjects gambled more often on loss frame trials than gain frame trials, $F(1,88) = 98.99$, $p < .001$, $\eta^2 = .51$ (Figure 3), thus exhibiting a framing effect, consistent with prior studies (De Martino, Kumaran, Seymour, & Dolan, 2006; Tversky & Kahneman, 1981). There was a main effect of mood group, $F(2,88) = 6.83$, $p = .002$, $\eta^2 = .13$, which shows that different mood inductions lead to differ-

Figure 3: Mood induction effects on gambling and framing.

The proportion of the gambles accepted as a function of the frame and the mood induction condition are shown. Bars represent the standard error of the mean.

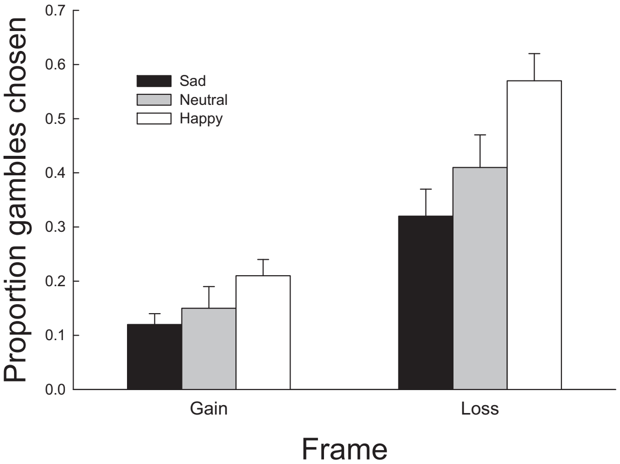


Table 1: Repeated-measures ANOVAs examining the effects of mood induction across pairs of moods.

	F-ratio	P-value	η^2
Happy v. Sad			
Mood	F(1,63) = 13.88	p < .001	$\eta^2 = .18$
Frame	F(1,63) = 70.29	p < .001	$\eta^2 = .51$
Mood x Frame	F(1,63) = 5.16	p = .03	$\eta^2 = .04$
Happy v. Neutral			
Mood	F(1,58) = 5.21	p = .03	$\eta^2 = .08$
Frame	F(1,58) = 74.62	p < .001	$\eta^2 = .55$
Mood x Frame	F(1,58) = 2.02	p = .16	$\eta^2 = .02$
Neutral v. Sad			
Mood	F(1,55) = 1.20	p = .28	$\eta^2 = .02$
Frame	F(1,55) = 55.32	p < .001	$\eta^2 = .50$
Mood x Frame	F(1,55) = .69	p = .41	$\eta^2 < .01$

ent propensities to gamble (Figure 3). Post-hoc pairwise comparisons revealed that subjects who experienced the happiness induction selected the risky option more often than those who experienced either the sadness induction, $t(63) = 3.725$, $p < .001$, or the neutral mood induction, $t(58) = 2.282$, $p = .026$. Propensities to gamble did not differ between subjects in the sadness and neutral mood inductions, $p > .2$.

In addition, the mood by frame interaction was almost significant, $F(2, 88) = 2.89$, $p = .06$, $\eta^2 = .03$, with greater effects of mood in the loss frame (Figure 3). Moreover, the framing effect was significantly greater in the happy-induction condition than in the sad-induction condition ($t(68) = 2.27$, $p = .027$). However, the effect of mood on gambling rate could account for this effect. In particular, when the gambling rate is near .5 (combining both framing conditions), framing effects have a much greater potential range. The range varies from 0, when the gambling mean is 0 or 1, to 1 when it is .5. To examine the effects of range, we divided the framing effect by the maximum range for each subject and asked whether this ratio differed between the happy and sad induction conditions. We found no difference ($t(58) = 0.48$; subjects with 0 possible range were excluded). Thus, it remains unclear whether induced mood can affect the magnitude of the framing effect.

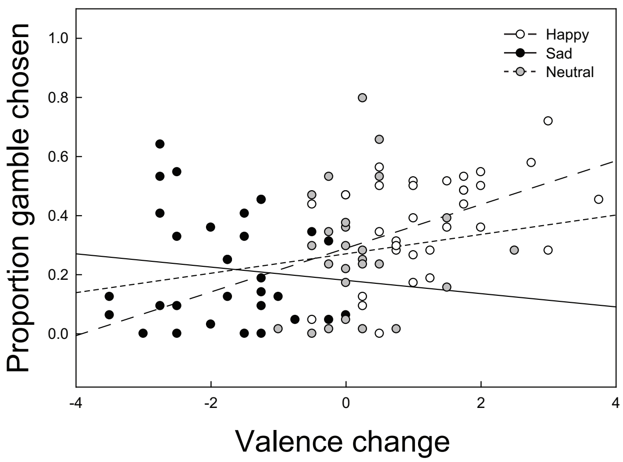
Follow-up repeated-measures ANOVAs were computed separately across the mood induction group pairs (Table 1). For the happy vs. neutral comparison, there was a main effect of mood, $F(1{,}58) = 5.21$, $p = .03$, $\eta^2 = .08$, and no significant interaction between mood and frame, which shows that happy subjects gambled more than those in the neutral condition, but their framing effect was of similar magnitude. For the happy vs. sad comparison, there was a main effect of mood, $F(1{,}63) = 13.88$, $p < .001$, $\eta^2 = .18$, and an interaction between mood and frame, $F(1{,}63) = 5.16$, $p = .03$, $\eta^2 = .04$, which shows that happy subjects gambled more than those in the sad condition, and their framing effect was of greater magnitude. For the sad vs. neutral comparison, there was no significant effect of mood and no significant interaction between mood and frame, which shows that there was no difference in gambling frequency or framing magnitude (Figure 3; Table 1).

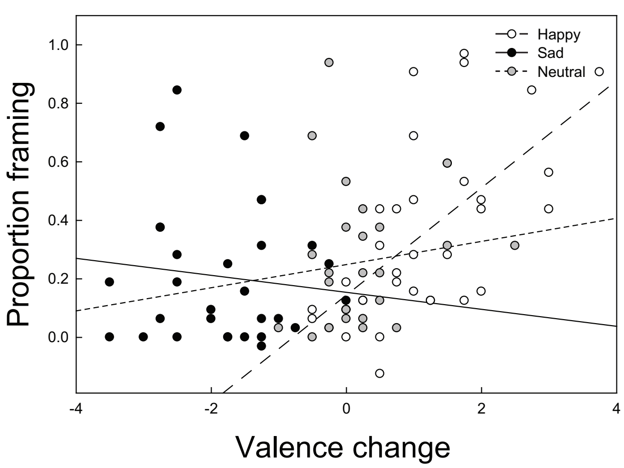
To further interrogate the mood effects, the intensity of subjects' self-reported changes in incidental mood (i.e., average valence change across blocks) was used to predict their rate of gambling and the magnitude of their framing effect. Across all subjects, mood valence change was positively associated with gambling frequency, $r(88) = .35$, $p = 0.001$, as well as the magnitude of subjects' framing effect, $r(88) = .35$, $p = .001$. For those subjects who experienced the happy mood induction, the amount of change in their valence ratings predicted gambling frequency, $r(31) = .44$, $p = .01$, as well as the magnitude of their framing effect, $r(31) = .61$, $p < .001$ (Figure 4). In other words, the happier they became, the more they gambled and the larger was their framing effect. Neither of these effects was found for subjects who experienced either the sad mood or the neutral mood inductions—there was no relationship between the amount their valence ratings changed and the amount they gambled (Sad: $r(29) = -.11$, $p = .55$; Neutral: $r(24) = .12$, $p = .57$), nor on the magnitude of their framing effect (Sad: $r(29) = -.12$, $p = .53$; Neutral: $r(24) = .12$, $p = .55$) (Figure 4). Furthermore, the effects in the happy-

Figure 4: Mood valence changes, gambling, and framing.

Panel A: Correlations between subjects' change in valence and the overall proportion of gambles accepted as a function of mood induction are shown. Induced changes in mood significantly correlated (r = .44) with gambling behavior for subjects experiencing the happy mood induction, but not for subjects experiencing the sad or neutral mood induction.

Panel B: Correlations between subjects' change in valence and the magnitude of the framing effect on as a function of mood induction are shown. Induced changes in mood significantly correlated (r = .61) with framing effect magnitude for subjects experiencing the happy mood induction, but not for subjects experiencing the sad or neutral mood induction.





mood condition were not attributable to arousal, as arousal change did not correlate with either gambling ($r = .08$) or valence change ($r = .25$).

Following the happiness induction, self-reported changes in valence were associated with changes in both overall gambling propensity and framing effect magnitude. However, it remains ambiguous whether the effects of increased happiness on framing effect magnitude occurred independently from or emerged due to the increased gambling rate. As described earlier, we examined the correlation between valence change and the ratio of framing to its possible range in the happy induction condition. This time the correlation remained significant (r = .45, p = .01). No such effect was found in the other mood-induction conditions. In sum, increased happiness amplified framing effects, and this relationship persisted even after accounting for the impact of happiness on overall gambling rates.

4 Discussion

The present data demonstrate that induced mood states can influence economic decision making and provide novel insight into the affective mechanisms underpinning economic decisions. Subjects induced into a happy mood gambled more often than individuals induced into a neutral or sad mood. Additionally, subjects induced into a happy mood appeared to exhibit a greater framing effect than individuals induced into a sad mood, but not a neutral mood. Moreover, the magnitude of the increase in subjects' positive affect following the happiness inductions positively correlated with their gambling frequency and framing effects—the happier they became, the more they gambled and the larger their framing effect. This relationship was specific to the valence dimension of positive affect and could not be explained in terms of changes in arousal. Additionally, the relationship between positive valence change and framing effect following the happiness induction remained after taking into account the sensitivity of the framing measure to gambling propensity. In contrast, for those who received the sad and neutral mood induction, the magnitude of their mood change was not correlated with their gambling frequency or framing effects, and induced sadness did not lead to economic decision making that differed significantly from neutral mood.

The finding that happiness increases risk-taking in the present study is consistent with several core theories of the relationship between emotion and attitudes towards risk. Positive moods may signal safety, leading one to discount potential negative consequences of risk-taking (Clore & Huntsinger, 2007). Additionally, affect facilitates retrieval of mood-consistent information (Bower, 1981). As many preferences are constructed (Johnson, Haubl, & Keinan, 2007; Payne, Bettman, & Johnson, 1993), enhanced access to positive information and optimistic assessments may lead to more risk-seeking behavior. Previous demonstrations have found that positive affect leads to more optimistic assessments regarding risk (Johnson & Tversky, 1983, Lerner & Keltner, 2001, Arkes, Herren, & Isen, 1988, Khan & Isen, 1993). The present experiment employed film clips to induce moods in the laboratory, an effective affective elicitation method (Gross & Levenson, 1995). Additionally, employing multiple film clips for each mood manipulation may have reduced the influence of mood irrelevant idiosyncratic factors on the present findings. Overall, the present findings align with previous demonstrations that happiness increases risk taking.

The capacity of frames to drive preference shifts, insofar as it exists, presumably derives from affective responses evoked by the frames. Indeed, the framing task recruits brain areas that underpin affective functions (De Martino, Kumaran, Seymour, & Dolan, 2006). Intentional efforts to down-regulate affect induced by frames diminishes gambling propensity in the framing task (Cheung & Mikels, 2011), further suggesting a link between choice behavior and emotions evoked by frames. By robustly manipulating affective state, the present study informs our understanding of the affective processes underlying framing effects. Induced happiness increases gambling frequency and may enhance frame-driven preferences. Happiness may enhance approach motivation by broadening attentional focus, promoting exploration, enhancing reliance on environmental information, and diminishing the influence of loss aversion on choice deliberation (Clore & Huntsinger, 2007; Fredrickson, 2004). This enhanced approach motivation would predict increases in gambling frequency, which is reflected in the present data. The enhanced magnitude of individuals' framing effects following happiness compared to sadness induction also implicates an alteration in cognitive processing. Affective states characterized by high certainty, such as happiness, are also associated with enhanced reliance on heuristic-based as opposed to systematic processing (Tiedens & Linton, 2001), consistent with the observed enhanced susceptibility to decision frames. Happy mood may also promote changes in affective processing in response to presented frames. Despite the efficacy of the sad mood induction in altering subjective valence ratings, the sad mood induction did not alter decision-making behavior as compared to the neutral mood in terms of either gambling frequency or framing magnitude. Although the specific mechanism through which happiness exerts its influence on choice behavior cannot be isolated by the current experiment, the monotonic relationship observed between positive affect generated by the happiness induction and both gambling frequency and the observed framing effect strongly implicates affective experience in altering choice behavior.

The apparent finding that happy moods increase subjects' responsiveness to decision frames (in comparison to sad mood) in guiding their choices is consistent with several core theories outlining the relationship between affect and decision making. The Appraisal Tendency Framework posits that emotional states prompt certain cognitive styles (Han, Lerner, & Keltner, 2007; Lerner & Keltner, 2000, 2001). These findings are also consistent with predictions from Affect as Information theory, which suggests that happiness should promote both more global attentional orientation (Gasper & Clore, 2002) as well as more heuristic, shallow processing (Clore & Huntsinger, 2007). Intriguingly, the present findings diverge from predictions by theories that posit a role for positive affect in promoting more efficient, elaborative processing (Fredrickson, 2004; Isen, 2008; Wegener, Smith, & Petty, 1995). Predictions from these theoretical perspectives would assert that positive affect should promote enhanced processing of the alternatives, particularly when the task in engaging and information is relevant to performance (Isen, 2008). This position thus predicts diminished framing effects as subjects in positive moods should scrutinize the information presented, the exact opposite of the pattern observed here.

One important consideration, which we noted earlier, is that the base rate of gambling behavior may alter the sensitivity of a task for detecting variability in subjects' choices; i.e., framing effects may arise and be more sensitive to manipulations when subjects gamble approximately half the time. In cases where gambling rates are near floor or ceiling, framing effects as traditionally computed are necessarily near zero. Such factors can present challenges to analyses and undermine conclusions. In the present data, happiness promotes greater rates of gambling as well as enhanced framing effects. Thus, it could be argued that our data reflect an effect of mood on gambling more than an effect of mood on framing. While we prefer to interpret the present evidence as indicative that incidental mood effectively altered both subjects' rates of gambling and the magnitude of the framing effects, the issue of potential effects of gambling on the sensitivity of framing data to external manipulations should be considered in future research using a framing task.

The present findings spark future avenues of inquiry regarding other potential influences of emotions on sensitivity to choice frames. For instance, other specific emotions, such as fear or pride, may influence gambling propensity and susceptibility to decision frames and characterizing their effects could inform the contribution of particular appraisal states or action tendencies to choice behavior. As the present demonstration that mood alters the influence of frames on decisions is based on one experimental investigation, future work should also seek to replicate and extend these findings. An important question for empirical studies of emotion is the extent to which transient affective states can exert lasting consequences on behavior and mental processes. For instance, if one learns about mortgage options and formulates tentative preferences in one affective state but commits to the decision at a later time after that state has dissipated, to what extent would the initial mood shape their final choice?

The present study demonstrates that induced affect alters individuals' reliance on decision frames when evaluating economic decisions. Induced happy mood states increased gambling propensity and possibly magnified framing effects compared to sad mood states, and increased gambling propensity compared to neutral mood states, which provides insight into the affective processes underlying the impact of frames on choices. The framing of information within decision architecture affects how individuals make decisions in real-world contexts like medical decision making (Armstrong, Schwartz, Fitzgerald, Putt, & Ubel, 2002) and social security (Brown, Kapteyn, & Mitchell, 2011). Elucidating how affective contexts alter the impact of decision frames has the potential to inform how decision-related contexts are understood, regulated, and manipulated by both professional and lay decision makers.

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Appendix: Expected value-biased trials

The 32 expected value-biased trials involved certain options and gambles that had different expected values. Specifically, for half of these trials, subjects had a 95% chance of keeping the endowment if they took the gamble versus a certain option of 50% of the endowment. For the other half of the trials, subjects had a 5% chance of keeping the endowment if they took the gamble versus a certain option of 50% of the endowment (see De Martino, Kumaran, Seymour, & Dolan, 2006). For example, a bias trial might have started with an endowment of $100. The subsequent choices would have been a $50 certain option versus a gamble with a 95% chance of keeping the whole endowment, i.e. an expected value of $95.

To counter the possibility that the effects of positive mood on decision making result from subjects' insensitivity to value information, we investigated the impact of biased expected value on subjects' choices. A repeated-measures ANOVA was conducted on the proportion of gamble options accepted on value-biased trials with Bias (expected value favors gamble or certain option) and Frame (gain frame, loss frame) as within-subjects factors and Mood (happy, sad, neutral) as a between-subjects factor. Results indicated a main effect of Frame, $F(1, 88) = 18.95$, $p < 0.001$, which shows that subjects were more likely to take the gamble option in the context of a loss frame, and a main effect of Bias, $F(1, 88) = 1074.34$, $p < 0.001$, in which subjects accepted 88% of gambles when the bias favored the gamble but only 6% of the gambles when the bias favored the certain option. There was no effect of mood group $F(2, 88) = 1.00$, $p = 0.37$, nor were there any significant 2- or 3-way interactions between these variables (all ps > .1). Importantly, the fact that mood induction had no effect on the use of expected value information indicates that subjects did not simply adopt a task set and ignore gamble parameters. Critically, these effects further demonstrate that the findings from the 64 non-biased trials were not due to an insensitivity to information regarding the options presented, but rather genuine risk preferences.