



# An Attention-Based Approach to Understanding the Influence of Induced Affective States on Risky Decision-making



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## Abstract

We investigated whether induced affective states (negative or neutral) can affect the process and outcomes of decisions under risk. Participants responded to 16 decision problems, each offering a pair of decision options: 1) sure gain vs. mixed-domain risky or 2) sure loss vs. mixed-domain risky. By using eye-tracking based attentional measures in the context of mixed-domain decisions, we can track decision-makers' attention to both positive (gain) and negative (loss) information during decision-making. This also enables investigation of whether mood affects the use of heuristic versus analytic strategies.

## Introduction

### Mood Congruence or Mood Maintenance?

**Mood Congruence:** affective states may influence decision-making because the decision maker selectively attends to emotion-relevant information, pushing their decision outcomes in a mood-congruent direction (Niedenthal & Setterlund, 1994).

- Affect Infusion Model (AIM)  
Positive moods -> attention to positive information -> risk-seeking  
**Negative mood -> attention to negative information -> risk-averse**

**Mood Maintenance:** affective states motivate behavior such that individuals act to maintain or attain positive mood states (Kliger & Kudryavtsev, 2014).

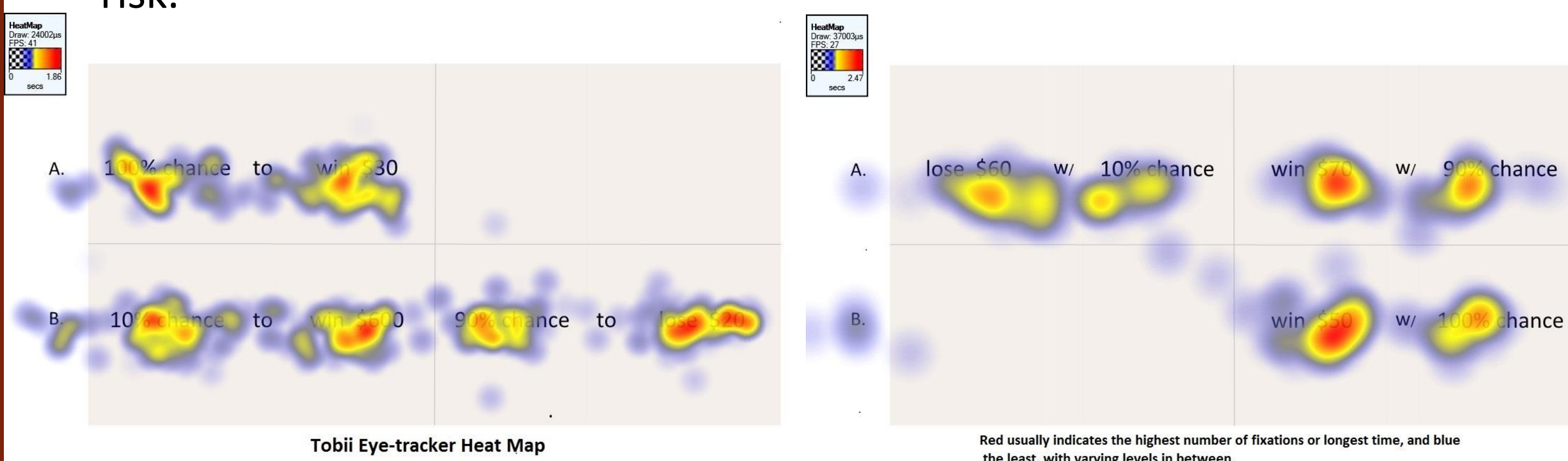
- Mood-Maintenance Hypothesis (MMH)  
Positive mood -> motivation to maintain the mood -> risk-averse  
**Negative mood -> motivation to relieve the mood -> risk-seeking**

### Heuristic vs. Systematic Strategy?

- It has also been suggested that individuals who are in a positive mood are more likely to adopt a heuristic processing strategy, a tendency to use intuition and "gut feelings" with relatively little attention being paid to details. In contrast, individuals who are in a negative mood are more likely to adopt a systematic processing strategy, with careful analysis of information (George & Dane, 2016; Schwarz, 2000).

### Goals of the Present Study:

- To examine the contrasting predictions of AIM and MMH, and to further investigate use of heuristic and analytic strategies, we used eye-tracking based attentional measures to investigate individuals' allocation of attention to relevant problem information (gain vs. loss, value vs. probability) in a study of sure-thing outcomes paired with mixed-domain options in decisions under risk.



## Methodology

### Study Procedure:

- 1. Calibration**  
➤ A procedure with the eye-tracker to enable accurate gaze point calculations.
- 2. Mood Induction Task**  
➤ News-story reading: Participant reads one story categorized as either "sad" or "neutral" (both from The New York Times).
- 3. Self-reported Mood Questionnaire (before and after the DM task)**  
➤ Participants rate on a 7-point Likert scale how well each of the following terms (angry, depressed, sad, neutral, interested, bored, irritable, annoyed, calm, discouraged, relaxed) describe how they feel at that moment.
- 4. Decision-making Task**  
➤ Participants make a choice on 16 mixed-domain decision problems (randomized and counterbalanced), that varied in problem structure: offering a choice between either: a sure gain vs. a mixed risky option (**PS1**), or a sure loss vs. a mixed risky option (**PS2**).

A.	100% chance to win \$50		A.	lose \$100 w/ 95% chance	win \$80 w/ 5% chance
B.	90% chance to win \$70	10% chance to lose \$60	B.	lose \$40 w/ 100% chance	

### 5. Demographics Questionnaire

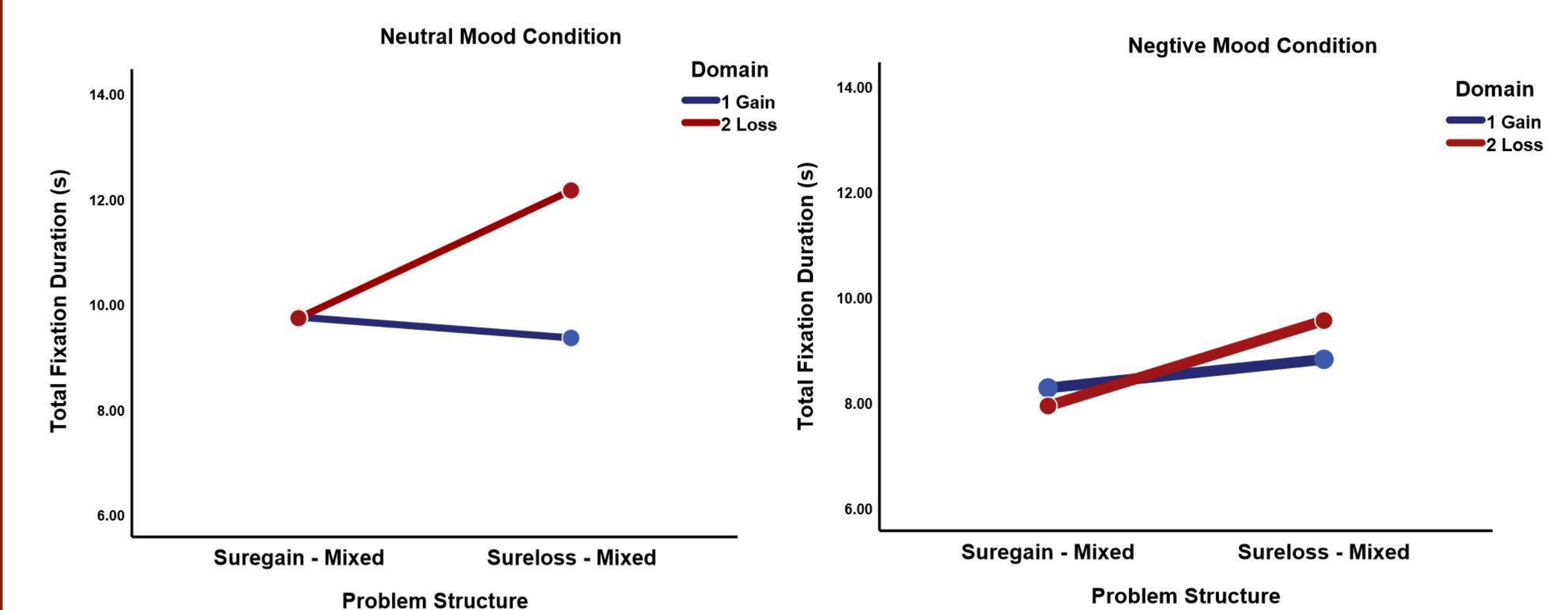
## Findings

- The mood inductions were effective, as judged by manipulation checks comparing self-reported mood measures for the two mood conditions:
  - $F(2, 55) = 21.143, p < .001$  (1<sup>st</sup> Mood Check – Before DM task)
  - $F(2, 55) = 3.495, p = .037$  (2<sup>nd</sup> mood check – After DM task)
- **CHOICE:** A mixed-model ANOVA of participants' choice behavior showed no effect of mood condition on the probability of EV-consistent choices. However, participants' choices were found to be significantly affected by problem structure ( $F(1, 56) = 9.846, p = .003$ ): Participants had more EV-maximizing choices for PS2 (sure loss - mixed) problems than for PS1 (sure gain - mixed) problems.
- **FIXATION DURATION:** Participants in both mood conditions paid more attention to values than to probabilities,  $F(1, 56) = 25.785, p < .001$ .
- Although there was no overall difference in mean total fixation time between the mood conditions in the ANOVA, results from a sign test suggested that sad-mood participants consistently had shorter fixation times than did neutral-mood participants for both PS1 (sure gain - mixed) and PS2 (sure loss - mixed) problems ( $p = .013$ ).
- A significant three-way interaction among *Domain (gain vs. loss), Mood Condition, and Problem Structure* was found,  $F(1, 56) = 4.645, p = .035$ .
  - ❖ Participants spent more time inspecting the risky-option information for sure loss - mixed problems than for sure gain-mixed problems, and in those sure loss - mixed problems, participants tended to focus longer on loss information (compared to gain information) for the risky mixed options.

## Findings (cont.)

- This Domain by Problem Structure interaction was especially pronounced for neutral-mood participants (Figure 1); sad-mood participants tended to spend less time overall, and allocate their attention more equally to relevant problem information.

Figure 1. The Three-way Interaction Among Condition, Domain and Problem Structure



## Discussion

These results are at variance with prior claims in the literature that individuals in a sad mood are more likely to adopt a systematic processing strategy, with careful analysis of information. In terms of choices, we found no difference in the rate of EV-maximizing between mood conditions. Our attention data shows that individuals in a sad mood had shorter total fixation time and a more uniform pattern of attention allocation. We interpret this pattern as indicating that sad-mood participants used a less analytic approach, perhaps as a way to reduce cognitive load. In contrast, participants in a neutral mood did a better job of focusing on critical problem information (potential losses versus gains), thus they could be described as being more analytic.

## Reference

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