The Effect of Hunger on Risky Choices for Food and Money: When Drive Drives Risky Choices

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Abstract

Dual-process models of risk preference contrast rational cognitive processes with emotional or drive states, accounting for many results, such as irrational biases. However, there are few experimental tests of predictions about drives. Manipulating hunger, we show that being in a drive state increased risk aversion for food and money, the opposite of predictions. The effect was found across age groups and gain-loss frames. Importantly, these results put in question the mechanisms found in distinct models, which are among the very few theories that formally incorporate the effect of a "hot" state to account for risky choice. New theories are discussed.

Introduction

Background and Theoretical Framework

- Our choices as human beings are taken under varying levels of hunger intensity, which highlights the importance of understanding its systematic role in decision making
- Literature suggests hunger has a profound impact on choice behavior in a variety of domains – particularly risky decision-making
- In some cases, a positive relation between hunger and higher risk seeking behavior (compared to less hungry people) was found for either monetary or food rewards, yet opposite findings (at least on average) have also been observed
- There are very few theories that propose a formal account for the impact of drive states on decision making under risk: Two similar traditional dual-system models by Loewenstein, O'Donoghue, & Bhatia (2015; LOB) and Mukherjee (2010), and Fuzzy-Trace Theory (FTT)

Theory	Description	Implementation in Decision Making
Dual-System Models (LOB and Mukherjee)	***Deliberative ("cold") System***: represented by a standard expected value (EV) formulation	Motivational drives trigger the affective system, which leads to deviations from EV-based decision making, such as framing effect
	Affective ("hot") System: consists of key properties of prospect theory	
Fuzzy-Trace Theory	***Verbatim***: representation of precise details of the information	Gist-based intuition underlies cognitive biases such as framing
	Gist: refers to the bottom-line, essential meaning implied by the information	

Objectives of Current Work

- To draw a connection between the effect of hunger and risk-taking behavior (with both financial and food related choices) using a risky-choice framing task
- To examine the extent to which framing biases are sensitive to hunger
- To contrast our findings against theoretically driven hypotheses

Hypotheses

Theory	Formal Predictions
Dual-System Models (LOB and Mukherjee)	**As hunger intensifies**: ○ The likelihood to obtain a pattern of framing behavior increases ○ The likelihood to obtain risk averse behavior for both gains and losses decreases
Fuzzy-Trace Theory	**As hunger intensifies**: ○ The likelihood to obtain a pattern of framing behavior decreases

Methods

Participants and Manipulation

- A total of 119 participants (73 female) were recruited from two different age groups: 63 adolescents (M = 16.84, SD = 1.347), 56 adults (M = 34.38, SD = 6.591)
- A subgroup of 57 participants (31 adolescents, 26 adults) was randomly assigned to the hungry (treatment) group and instructed to refrain from eating for at least four hours prior to participating in the experiment. Subjects in the control group had no restrictions on their eating behavior

Materials and Procedure

- Each participant completed a risky-choice framing task that included 216 trials with money (US dollars) and food (M&M's) stimuli in return for monetary compensation
- Each trial began with a preamble designed to orient the subjects' endowment and provide general information about the decision at hand
- Subjects were required to make a choice between a riskless payoff (either money or food) and a binary gamble (with zero as one of its outcomes), with an expected payoff equal to that of the riskless option
- Information in the gamble was manipulated in accordance with fuzzy-trace theory's paradigm (by removing redundant information from the gamble):
  - In the **mixed condition**, the gamble was presented in the traditional way, where all the information (probabilities and payoffs) was shown
  - The **gist truncation** showed the gamble without the nonzero complement
  - The **verbatim truncation** showed the gamble without the zero complement

Results

Three-Way Interaction Effect of Decision Frame, Age-Group, and FTT Truncation

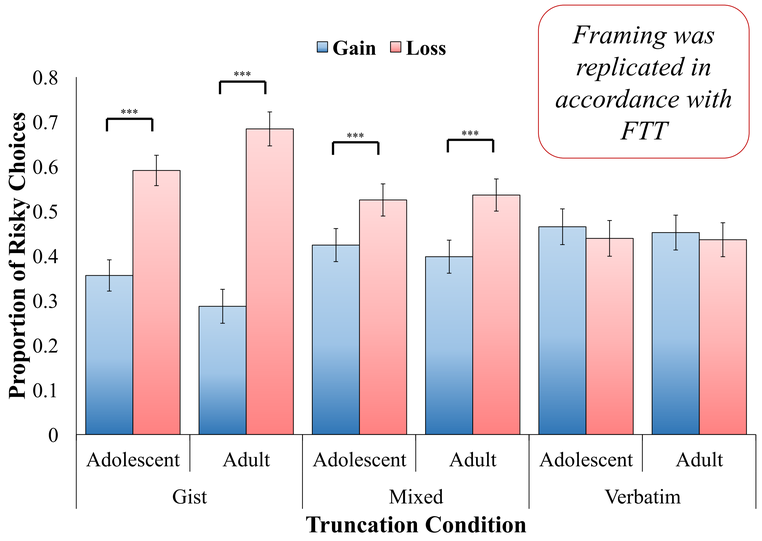
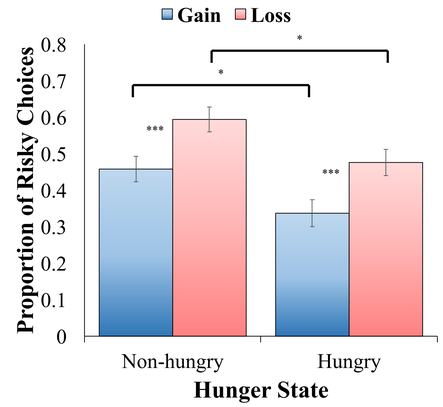


Figure 1. A three-way interaction effect of decision frame, age group, and FTT truncation. Bars represent mean proportion of risky choices. Error bars represent ±1 *SE*.

Main effect of hunger across the two decision frames



The same patterns of risk attitude and framing effect hold across the two hunger states and within each frame

Figure 2. Interaction between hunger group, and decision frame (interaction is not significant). Bars represent mean proportion of risky choices. Error bars represent ±1 *SE*.

Discussion

- A significant framing bias was found for both hungry and non-hungry subjects
- Framing was sensitive to truncation effects in accordance with fuzzy-trace theory:
  - Bias was **eliminated** in the verbatim truncation and **enlarged** in the gist truncation
  - Truncation effects violate core assumptions underpinning both *expected utility* and *prospect theory* and thus cannot be accounted for by LOB and Mukherjee's models
- Results also show that hunger is a powerful driver of decision making. Food deprived subjects exhibited significantly higher risk-aversion with the same overall size of framing effect
- The directional effect of hunger holds for both gain and loss-framed decisions
- This effect goes against formal hypotheses derived from the two traditional dual-system models, and neither supports nor contradicts hypotheses derived from Fuzzy-Trace Theory
- Our findings suggest that hungry people are willing to settle for something with certainty rather than take a chance of ending up with nothing - irrespective of whether the decision is framed as a gain or as a loss
- Future directions should focus on formulating theories that can better account for the observed systematic patterns of behavior under the influence of drive states, such as hunger

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