Risk preferences in option generation: Do risk-takers generate more risky courses of action?

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INTRODUCTION

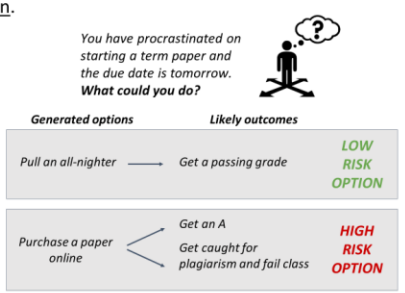
Risk preference represents an individual's tendency to take actions that involve more or less uncertainty regarding the ultimate outcome. Although a wealth of research has linked risk preferences to decision making (Mata et al., 2018), past work has largely focused on choices between predetermined sets of options. Yet in many uncertain, real-world decisions, people are not provided a "menu" of possible actions: they must generate choice options for themselves.

Do risk preferences affect how people *generate* options in ill-structured decisions?

We hypothesized that risk-taking propensity would be related to the generation of actions associated with uncertain or unfavorable outcomes: i.e., that risk-takers would be more likely to generate risky courses of action.

We adapted an option generation task (Schweizer et al., 2016) in which people generate potential actions in ill-structured scenarios.

- While past work has focused on the quantity and quality (e.g., feasibility, creativity) of generated options, we examined the amount of **perceived risk**
- We measured **familiarity** with each scenario to evaluate whether risky options are generated through memory retrieval or ideation (del Missier et al., 2015)
- We also measured **affective variables** to assess any impact on the riskiness of generated options



METHOD

Option Generation Task:
Twelve scenarios (with 3 scenarios each for four domains: ethical, financial, health/safety, and social) were designed to elicit both low and high-risk options:

Imagine you find yourself in the following situation: What could you do?

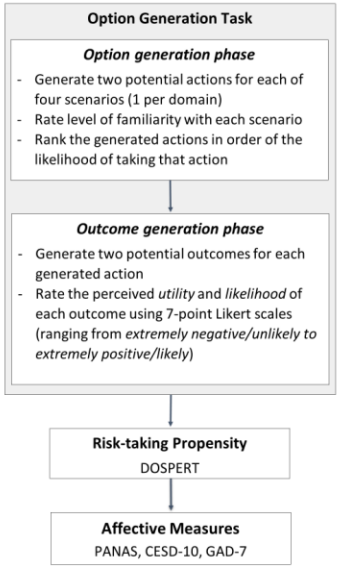
Ethical	You stop by a store to grab an item you need. You are in a hurry but the cashier is nowhere to be seen.
Financial	Rent is due in one week and you don't have enough money to make your payment.
Health/Safety	On the morning of an important job interview, you wake up with fever and chills.
Social	You're out drinking with your boss, who becomes intoxicated. When you leave the bar they insist on driving themselves home.

Risk Propensity was measured with the Domain-Specific Risk Taking scale (DOSPERT; Blais & Weber, 2006), which assesses the tendency to take risks in five domains: ethical, financial, social, safety/health, and recreational.

Affective Measures:

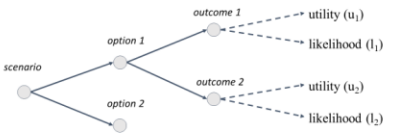
- Positive and negative affective state (PANAS;Watson, Clark, & Tellegen, 1988)
- Depression (CESD-10; Radloff et al., 2012) and generalized anxiety (GAD-7; Spitzer et al., 2006) symptoms

Participants:
N = 99 participants from Amazon Mechanical Turk (52% female; age M = 43.1 yrs, SD = 12.3) completed the task



RESULTS

Option scoring. Outcome ratings were used to score the riskiness of each option. We created scoring methods to capture two distinct conceptions of risk that appear in the psychology and economics literature (Mata et al., 2018):



Risk index (R), the likelihood of undesirable outcomes:

$$R = -(w_1 * u_1 + w_2 * u_2)$$

where u_1 and u_2 are the outcome utility ratings and w_1 and w_2 are the normalized likelihood ratings. The weighted sum is negated such that higher scores reflect greater perceived risk for an option (i.e., that it is likely to lead to unfavorable outcomes).

Uncertainty index (U), the uncertainty in the favorability of potential outcomes:

$$U = 1 - |w_+ - w_-|$$

where w_+ and w_- are the perceived likelihood of all favorable and unfavorable outcomes, respectively. $U = 0$ for an option where only one type of outcome was generated (e.g., both outcomes were favorable), while $U = 1$ when unfavorable and favorable outcomes are perceived to be equally likely ($w_+ = w_-$).

Risk index and uncertainty index of the first generated option were modeled using linear mixed effects regression with random intercepts for participants:

Predictor	β	95% CI-lower	95% CI-upper	t	p
Risk index					
(Intercept)	-0.23	-0.39	-0.09	-3.03	0
Age	0	-0.15	0.19	0.03	0.97
DOSPERT (domain)	0.15	0.04	0.29	2.3	0.02*
Familiarity	0.04	-0.07	0.19	0.59	0.55
CESD	0.01	-0.31	0.28	0.1	0.92
GAD	0.08	-0.16	0.42	0.55	0.59
PANAS (negative)	-0.03	-0.21	0.1	-0.31	0.75
PANAS (positive)	-0.18	-0.35	-0.03	-2.22	0.03*
Uncertainty index					
(Intercept)	0.56	0.53	0.61	25.21	0
Age	0.06	0.02	0.1	2.69	0.01*
DOSPERT (domain)	0.03	-0.01	0.07	1.73	0.08
Familiarity	-0.01	-0.05	0.02	-0.61	0.54
CESD	-0.07	-0.16	0	-1.71	0.09
GAD	0.06	-0.01	0.15	1.46	0.15
PANAS (negative)	-0.06	-0.11	-0.02	-2.25	0.03*
PANAS (positive)	-0.05	-0.09	0	-1.96	0.05

Note: * p < .05, ** p < .01, *** p < .001.

- **Risk propensity:**
  - Increased risk taking propensity (DOSPERT) was associated with an increase in the likelihood of undesirable outcomes (risk index) for the first generated option (t(380) = 2.3, p = .02).
  - Increased risk taking propensity (DOSPERT) was marginally, but non-significantly, associated with uncertainty in the favorability of potential outcomes (uncertainty index) for the first generated option (t(379.4) = 1.73, p = .08).
- **Affective state:**
  - Greater negative affect (PANAS-negative) was associated with less uncertain first options (t(97.14) = -2.25, p = .03).
  - There was a negative effect of positive affect (PANAS-positive) where greater positive affect was associated with less frequent generation of first options that were expected to result in unfavorable outcomes (t(92.8) = -2.22, p = .03).
- There were no effects of familiarity on risk or uncertainty of generated options, and no interactions between familiarity and risk propensity.
- The same models were fit for the second generated option, but there were no significant effects.
- In 64% of trials, the first generated option was ranked as the action more likely to be chosen, a rate significantly greater than chance (OR = 1.75 [1.43, 2.15], z = 5.36, p < .001), consistent with the Take-the-First heuristic (Johnson & Raab, 2003)

CONCLUSIONS

1. **Risk-taking propensity was positively related to the riskiness of generated options**: Among risk-seeking individuals, the first option was perceived as more likely to result in unfavorable outcomes. The relationship between risk-taking propensity and uncertainty index was not significant, suggesting that risk preferences are more closely tied to the overall favorability of generated options as opposed to the degree to which its outcomes were uncertain.

1. **Positive affect was associated with generation of first options that were less likely to result in unfavorable outcomes**, potentially because positive affect increases attention to favorable outcomes while neglecting the potential downsides of an action. In contrast, **greater negative affect was related to lower uncertainty of first options**, such that options that could produce *either* favorable or unfavorable outcomes were less frequent, echoing prior findings that negative affect is associated with an aversion to uncertainty (Boswell et al., 2013).

1. **Retrieval of past actions alone (i.e., familiarity) did not account for the observed relationship** between risk-taking propensity and the riskiness of generated options, suggesting that factors underlying risk-taking propensity also influence how people generate actions in novel circumstances.

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