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The Description-Experience
Gap in Risky Choice Framing

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Abstract

We examined whether the classical framing effect observed with the Asian Disease problem could be reversed when people make decisions from experience. Ninety-five university students were randomly allocated to one of three conditions: Description, Sampling (where the participants were allowed to sample through the outcomes presented as a pack of cards) and Interactive (where the participants were invited to spread out all possible outcomes in a sample) and made three gain-framed choices and three loss-framed choices, with two filler tasks after the first three choices. The results revealed a significant interaction effect between framing and choice condition. In the Description choice condition, participants were more risk-seeking with loss-framed problems. This pattern was reversed in the Sampling choice condition where participants were more risk-seeking with gain frames. Finally, the Interactive choice condition resulted in a classic pattern of framing effect, whereby people were more risk averse in the domain of gains.

Keywords: description-experience gap; risk-taking; framing effect; Asian disease problem; interactivity; distributed cognition.

Introduction

Choices are ubiquitous. They can be inconsequential (deciding what to wear) or involve sizeable risks (investing in a volatile stock). Decision-making often comes with a strong feeling of agency: People's preferences for choice alternatives as well as their perceptions of the risks associated may feel personal and unique yet, those preferences are highly contextual (Lichtenstein & Slovic, 2006).

An illustrious example of the impact of context on people's choices under risk is the so-called framing effect, most often illustrated with the Asian Disease choice task (Tversky & Kahneman, 1981). In this task, where people are asked to choose between two programmes for combatting "an unusual Asian Disease" expected to kill 600 people, based on the exact scientific estimates of the consequences of those programmes. Those estimates are then either presented in terms of lives saved (positive frame) or lives lost (negative frame). Thus the gin frame reads:

> If Program A is adopted, 200 people will be saved.

> If Program B is adopted, there is a 1/3 probability that 600 people will be saved, and 2/3 probability that no people will be saved.

By contrast, the loss frame reads:

> If Program A is adopted, 400 people will die.

> If Program B is adopted, there is a 1/3 probability that nobody will die, and 2/3 probability that 600 people will die.

In both frames, people are asked which of the two programmes they would favor. Programme A results in a sure outcome and is considered to be a risk-averse choice whereas Programme B results in an uncertain outcome, a risk-seeking choice. Typically, the gain-framed option elicits risk averse preferences as most people select the sure option. Conversely, the loss-framed option elicits risk-seeking preferences as most people presented with this frame opt for the uncertain alternative. This seminal finding has been replicated in numerous studies and applied in various domains (e.g., see Kühberger, 1998; Maule & Villejoubert, 2007 for reviews). Importantly, it illustrates how choice preferences can arise from the design of information in a decision-maker's environment.

Recently, research has shown that people's risk preferences can, not only be influenced by information design, but also by how this information is experienced. Hertwig, Barron, Weber and Ever (2004) compared people's preferences in a series of lotteries offering certain or uncertain monetary outcomes whose distributions were either described on a computer screen (e.g., "Get $3 for sure") or experienced through sampling by pressing a computer button (e.g., $3, $3, $3, ..., $3). When lotteries were described, people preferred the sure option in gain-framed lotteries and the uncertain option in the loss-framed lotteries. The key finding of their study, however, was that this pattern of preference reversal was itself flipped when people experienced the outcome distribution through sampling instead of reading a summary description: under sampling, people preferred the risky option in gain-framed lotteries and the sure option in the loss-framed lotteries. Although the preference reversal between gain-framed lotteries and loss-framed lotteries under description is similar to the framing effects observed with the Asian disease problem, the lotteries used by Hertwig et al.

(2004) were not designed to test for framing effects and thus differed from the Asian problem on at least two noteworthy features. First, whereas the Asian disease problem specifies a reference point (an expected loss of 600 people), the reference point was not specified in Hertwig et al.'s gambling tasks. Second, expected values and framing were confounded in the lotteries used by Hertwig et al. (2004) such that the uncertain option had a higher expected value in the gain frame whereas the sure option had a higher expected value in the loss frame. By contrast, the alternatives in the Asian disease task were designed to have equivalent expected values. A first objective of the present research was therefore to examine whether experiencing the outcomes in a classic framing task rather than reading a description of these outcome would also lead to a reversal of the classic framing effect.

In both the instance where outcome information is summarised in a short description and in the instance where it is experienced through sampling, people play a relative passive role in the acquisition stage. This, we have argued elsewhere (Vallée-Tourangeau, Abadie, & Vallée-Tourangeau, 2015; Villejoubert & Vallée-Tourangeau, 2011), seems to be a consequence of how decision-making in particular and cognitive processing in general has been conceived by scholars: as a series of mental operations on a mental representation of the outside world. An alternative, systemic perspective, recasts cognition as involving the co-occurrence of the cognitive processing of mental representations and the physical processing of material presentations. From this perspective, to understand how people reason or make decisions, one needs to understand how knowledge and thoughts emerge from the co-ordination of internal and external resources. For example, we previously showed that allowing adults to interact with the statistical information in Bayesian reasoning tasks through the manipulation of playing cards enabled most to succeed at solving these tasks without training (Vallée-Tourangeau et al., 2015).

A second objective of the present research was to examine whether (and how) increasing the affordances (i.e., the action possibilities) offered by the information display would impact framing effects. To achieve this, we allowed some of our participants to spread and rearrange the possible outcomes of the distribution payoff in any way they saw fit. We anticipated this would transform the nature of the experience. In experience through sampling, experienced outcomes typically result from minimal actions (e.g., the click of a button) and are best characterised a sequential observation of outcomes. By contrast, allowing people to interact with the payoff distribution by physically manipulating tangible representations of the different possible outcomes should augment people's ability to represent those payoffs and their probabilities. Whether this will strengthen or weaken framing effects remains to be established. On the one hand, a clearer representation may enhance people's computational abilities by reducing the cognitive load of switching focus between a gain-framed and a loss-framed representation, resulting in stable choices across frames. On the other hand, clarifying the representation of the distribution of outcomes in a given frame may reinforce the framing effect by making it harder to switch to the alternative frame.

A final objective for this experiment was to explore whether individual differences could predict framing effects. Previous research found some evidence that risk-averse individuals are more likely to shift their preference towards the sure option in gain frames (Huangfu, 2014; Mahoney, Buboltz, Levin, Doverspike, & Svyantek, 2011) although there was no evidence that risk propensity impacted choices in loss frames. We sought to expand on these findings by examining whether risk-taking and framing effects would be better predicted by individual differences in domain-specific risk taking. Moreover, interactive or experiential environments sometimes involve qualitatively different processes. For example, Weller, Villejoubert, and Vallée-Tourangeau (2011) found that insight performance in matchstick algebra problems was predicted by numeracy skills when the task was presented with a descriptive (static) statement, whereas it was predicted by matrix reasoning, a sub-component of the Beta III test (Kellog & Morton, 1999) for measuring visuo-spatial reasoning abilities, when the task was made interactive by through the use of physical and manipulable artefacts. In the present study, we therefore also sought to examine whether varying the level of interactivity afforded by the task would also moderate the impact of individual differences on risk-taking and framing effects.

Method

Participants

Ninety-five university students (54% Post-graduate, M_{age} = 23.8 years, SD = 4.5) took part in the experiment.

Materials, Design, and Procedure

Participants were randomly allocated to one of three experimental conditions: a Description choice condition, a Sampling choice condition and an Interactive choice condition and were asked to complete three problems presented in a gain frame (number of people who will be saved) and three problems presented in a loss frame (number of people who will die). Thus the experiment employed a mixed 2-within (Frame: Gain vs. Loss) x 2-between (Choice condition: Description, Sampling, Interactive) design. The order of presentation of the gain and loss frames was counterbalanced (half of the participants completed the three gain-framed problems first; the remaining half started by completing the loss-framed problems). The order of the three problems was randomized within each frame condition. For each problem solved, we recorded the time spent, the alternative chosen (sure vs. risky), and the strength of their preference (1= Extremely weak to 6 = Extremely strong).
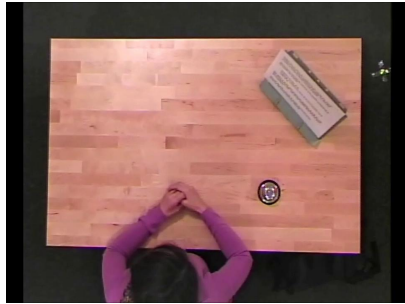
Description condition   Sampling condition   Interactive condition

Figure 1: Birdseye screenshots of the experimental setting in each experimental condition.

Participants completed two self-report scales after they had completed the first set of three problems: The 30-item Domain Specific Risk-Taking Scale (DOSPERT, Blais & Weber, 2006) and the Barratt Impulsiveness Scale Version 11 (BIS-11, Patton, Stanford, & Barratt, 1995)[1]. The DOSPERT scale is composed of five subscales for measuring domain-specific risk-taking preferences: Ethical (e.g., "Revealing a friend's secret to someone else"), Financial (e.g., "Betting a day's income at the horse races"), Health & Safety (e.g., "Sunbathing without sunscreen"), Recreational ("Taking a skydiving class"), and Social (e.g., "Starting a new career in your mid- thirties"). Participants were asked to rate the likelihood that they would engage in the described activity or behavior on a 7-point labelled likert scale ranging from 1 (Extremely unlikely) to 7 (Extremely likely).

The task scenarios were adapted from Mahoney, Buboltz, Levin, Doverspike, and Svyantek (2011) and all presented a life-threatening disease. Each task was presented on a laminated A4 sheet of paper. In the Description choice condition, following the presentation of the possible consequences of each alternative, participants were asked to decide which program they would favor (A or B). In the sampling choice condition, participants were presented with two packs of 25 cards and asked to assume that the possible consequences of the programs were represented by the two packs of cards in front of them. They were informed that, upon turning a card over, they would see a possible consequence for the selected program in terms of the number of people saved [killed]. They were also told that they were not allowed to pick the packs of cards and may only look at one card at a time, from either deck. Participants in the interactive choice condition were also presented with two packs of 25 cards but they were invited to pick up the decks of cards and turn over and spread out all the cards in front of them. Within each condition, some participants were filmed, with their consent, from a camera attached to the ceiling and offering a birdseye view of their actions on the cards. Figure 1 illustrates the setting for the three experimental conditions. Figure 2 illustrates the cards used.

Figure 2: Schematic representation of the cards used in the Sampling and Interactive conditions.

Results

Choice latencies

The average choice latencies for the three problems in the gain and loss frames in the three experimental conditions are reported in the left panel of Figure 3. Participants were slowest to formulate a choice preference in the interactive condition, and fastest in the descriptive condition, while the sampling condition produced marginally slower latencies relative to the descriptive condition; choice latencies appeared unaffected by framing.

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[1]The BIS-11 scale was used as a filler task and results will not be reported or discussed further in this report.
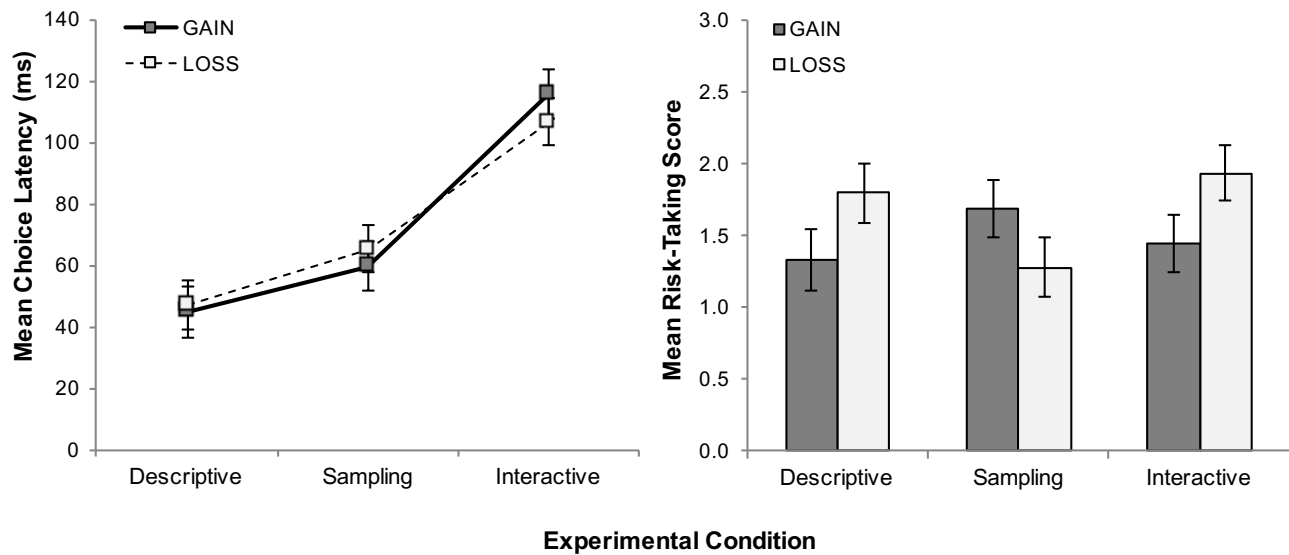
Figure 3: Mean choice latencies (left panel) and mean choice score (right panel) in the gain and loss frame in the three experimental conditions. Error bars are standard errors. .

A 2-within (Frame: Loss vs. Gain) x 3-between (Choice condition: Descriptive vs. Sampling vs. Interactive) mixed analysis of variance (ANOVA) confirmed these impressions: The main effect of condition was significant, $F(2, 92) = 26.1$, $p < .001$, $\eta^2_p = .362$, but not the main effect of frame, $F < 1$ nor the interaction, $F < 1$. Post hoc tests revealed that latencies in the interactive condition were significantly different than those in the descriptive ($p < .001$) and in the sampling ($p < .001$) condition, but that latencies in the descriptive and sampling conditions did not differ significantly ($p = .26$).

Risky choices

We computed the number of risky choices across gain-framed and loss-framed problems, respectively (from 0 to 3, in each frame). The mean composite score was higher for problems in the loss frame than in the gain frame in the descriptive and in the interactive condition (see the right panel of Fig. 3); however, in the sampling condition, the pattern was reversed such that risky choices were more frequent for problems in the gain frame than in the loss frame. The 2-within (Frame: Loss vs. Gain) x 3-between (Choice condition: Description vs. Sampling vs. Interactive) mixed ANOVA revealed that neither the main effect of condition, $F < 1$, or frame, $F(1, 92) = 2.45$, $p = .121$, $\eta^2_p = .026$, were significant, but that the interaction between frame and condition was significant, $F(2, 92) = 6.48$, $p = .002$, , $\eta^2_p = .123$. To unpack this interaction effect, we compared risk-taking scores in loss and gain frames within each experimental condition. People were significantly more likely to choose the risky option in the loss frame in the Descriptive condition, $t(29) = 2.25$, two-tailed $p = .032$, as well as in the Interactive condition, $t(32) = 2.42$, two-tailed

$p = .021$. However, they were significantly more likely to choose the risky option in the *gain* frame in the Sampling condition, $t(31) = -2.08$, two-tailed $p = .046$.

Individual Differences, Risk-Taking and Framing Effects

To examine whether framing effects depended on individual differences in domain-specific risk-taking and impulsivity, we computed a framing effect index by taking the difference between the risk-taking score in loss frames and the risk taking score in gain frames for each participant. A positive score indicated a classic framing effect (higher risk-taking in losses) whereas a negative score indicated a reversed classic framing effect (higher risk-taking in gains). We then examined the correlation matrix involving scores on the Ethical, Financial, Health & Safety, Recreational, and Social DOSPERT subscales and the framing effect index, within each condition. We found no evidence that risk-taking in framing tasks was related to individual differences in risk-taking across domains. The largest correlation was with financial and gambling risk-taking in the descriptive condition, $r(28) = -.30$, $p = .11$, with health and safety risk-taking in the sampling condition, $r(30) = -.30$, $p = .10$, and with ethical risk-taking in the interactive condition, $r(31) = -.27$, $p = .13$. By and large, risk-taking in framing tasks was unrelated to individual differences in risk-taking across domains in any of the three choice conditions. The only exception was the sampling condition where risk-taking in framing tasks was negatively correlated with risk-taking in the recreational domain in both loss frames, $r(30) = -.57$, $p = .001$ and gain frames, $r(30) = -.51$, $p = .003$. In other words, the *more* likely people were to engage in recreational risk-taking, the *less* likely they were to opt for the risky alternative in the lotteries.

Discussion

This research was informed by the distributed cognition framework, which seeks to understand cognition as it unfolds through time and space, taking into account the action possibilities or affordances offered by the ecology within which cognitive processes are taking place (see also Villejoubert & Vallée-Tourangeau, 2011; Vallée-Tourangeau et al., 2015). We found little evidence to support the hypothesis that the relation between people's likelihood to engage in risky behavior and their risk-taking preferences in framing tasks could depend on the ecology within which they made their decision (i.e., whether or not they could search for information and the extent to which they could interact with it). In the interactive condition, people could spread all sample outcomes in front of them rather than sample them one at a time. This did not reduce framing effects, possibly because the artefacts used to support cognition did not afford a representational switch between a gain-framed and a loss-framed representation of the problem. This suggests that there are boundary conditions on the efficacy of an interactive ecology to support people's decision-making in a way that successfully reduces framing effects. We conceived interactivity as a feature of the ecology allowing for "sense-saturated coordination that contributes to human action" (Steffensen, 2013, p. 196). There were many possible actions in the interactive condition (picking up cards, sampling through packs, spreading cards on the table, sorting outcomes, and so on) and each action changed the manner in which the distributions of outcomes could be perceived. Stromer- Galley (2004) distinguished between interactivity as a feature of a medium and interactivity as feature of information processing in human communication. In this study, interactivity resulted from the availability of playing cards coupled with the absence of restrictions on what people could do with them; it was a product of the experimental design. Future research may examine how other forms of interactivity could impact framing effects, by using different artefacts to represent the distribution of outcomes, and by increasing interactive processing through groups (e.g., Milch, Weber, Appelt, Handgraaf, & Krantz, 2009) or game theoretic settings (e.g., Chapman et al., 2012).

Building upon the description-experience gap, we examined whether the classical framing effect observed with the Asian Disease problem could be reversed when people make decisions from experience. We also contrasted two types of experience: an experience by sampling, where participants sample single outcomes from two alternatives before making a choice, and an experience by interacting, where participants are allowed to spread all possible outcomes in a sample in front of them before making a choice.

To begin with, we replicated findings from Mahoney et al. (2001) showing that people succumb to framing effects even when they are presented with both a loss framed task and a gain framed task in a within-subject design. More importantly, we extended previous research documenting a "decision-experience gap" in monetary gambles (e.g.,

Hertwig et al., 2004), as we demonstrated that the framing effect could also be reversed when people sample outcomes before making a choice between a risky alternative and a sure outcome instead of reading a thumbnail description of the choice situation. Not all experiences were created equal, however, as when people were allowed to manipulate the sample of outcomes and spread them in front of them, the pattern of choices exhibited the standard framing effect, akin to what is usually observed with thumbnail descriptions. An inspection of response latencies showed that decision times increased in decision by sampling and were longest in decisions by manipulating in the interactive condition. The fact that decision times were shortest in the description condition but longest in the interactive condition suggests that framing effects do not necessarily arise from fast, non-deliberative judgements.

The reason for the framing effect reversal under sampling conditions remains to be accounted for. In the framing literature, framing reversals were created by manipulating the description of the outcomes. For example, Kühberger (1995) found that using negative descriptions (e.g., "400 people will not be saved" in the gain condition and "200 people will not die" in the loss condition) led to a reversal of the framing effects. This type of reversal is accounted for by the Explicated Valence Account (Tombu & Mandel, 2015). EVA stipulates that negative descriptions carry a negative explicated valence because they describe negative events (e.g., people who are *not* saved). Moreover, EVA proposes that people will prefer the option which maximizes the positive explicated valence, so when asked to choose between the sure outcome with a negative explicated valence ("400 people will not be saved") and a risky outcome including an event with a positive explicated valence (a chance that "600 will be saved"), people opt for the risky outcome even though the situation is framed in terms of gains (i.e., lives saved). The EVA, however, cannot be applied to explain the reversal observed in the sampling condition of the present study, since the explicated valence was always positive in the gain frame: outcomes were always described in terms of the number of lives saved.

Camilleri and Newell (2013) proposed that patterns of choices under sampling conditions result from the need to search information within the environment, and the need to integrate new information sequentially into a representation. The description-experience gap could thus result from a defective mental processing of probabilities informing the final choice in decisions from experience. There is a debate in recent literature on the description-experience gap as to whether these representations are distorted due to the limited sampling of rare events, overweighting of late observations, or both (Hertwig, Barron, Weber, & Erev, 2004; Hertwig & Erev, 2009). Our results provide some indirect evidence that limited sampling of rare events may hold for risk-framing tasks: in the interactive condition, participants did not need to search for information, they could display it directly in front of them. Consequently, they did not need to update their representation, they simply needed to build it from the layout

they had created. In other words, the interactive condition eliminated the sequential and potentially biased nature of information acquisition and representation that occurs in the sampling paradigm. This has been found to reduce the description – experience gap in research using monetory gambles (Camilleri & Newell, 2013) and would explain why risk-taking patterns in the interactive condition were similar to those observed in the descriptive condition.

Finally, there was some indication that recreational risk-taking could be negatively related to risk-taking in framing tasks, albeit only in the sampling condition. This suggests, somewhat counterintuitively, that risk-taking in the sampling condition was a serious and considered decision as people who took risks were those who were more likely to avoid taking risks "for fun" when making choices outside the laboratory. Future research could seek to unpack this finding to better understand the link between motivational styles (e.g., Apter, 1997) and behaviours in the sampling condition.

Acknowledgments

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