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Sequential Information Preferences in Uncertain Decision Making

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Although decisions often appear instantaneous, they can unfold dynamically with sequential processing of different types of information. Prior research finds that the order of considering risks versus rewards in uncertain decisions can influence the perceived value of a financial prospect. However, it remains unclear which information people might choose to learn first for themselves. Across 11 preregistered experiments ($N = 6{,}709$ adult participants from in-person and online pools), we demonstrate that a majority of people prefer to consider risks before rewards. This preference is associated with individual sensitivity to economic ambiguity, but not a general need for structure. We further show that self-selected sequences are useful not only for predicting information-seeking behavior in financial and marketplace contexts but also for predicting downstream behavior in terms of choice process and choice outcomes.

Public Significance Statement

People often come across choices about uncertain opportunities, sometimes related to making money, but also when evaluating options related to contexts like travel or health and wellness. To help choose, people can seek information about risks and rewards from an increasing array of sources, including digital agents. In this research, we develop insights on what kind of attributes they want to know first. Across 11 experiments, we find that a majority of people prefer to learn about risks before considering potential rewards when considering choices like buying lottery tickets or booking a hotel room. But seeing risks first can decrease the perceived value of the opportunity, causing people to buy less, pay less, or even drop out of the choice before learning the rest of the information. Overall, our work offers insights into how information preferences under uncertainty can shape decision making.

Keywords: uncertainty, risk, ambiguity, decision making, order effects

Supplemental materials: https://doi.org/10.1037/xge0001941.supp

Although decisions often appear instantaneous, they can unfold dynamically with sequential processing of different types of information. For example, in uncertain choices with risks and rewards, individuals might first consider the possible beneficial outcome or first consider the likelihood of that outcome occurring. Order matters here; the subjective value of a risky gamble increases when people learn the magnitude of possible rewards before probabilities (Millroth et al., 2019) and decisions where people view rewards before risks are made more quickly (Lopes & Ekberg, 1980), suggesting reduced deliberation. Indeed, it is generally been found that the information people encounter first in a sequence is not only more memorable (e.g., Anderson, 1973) but is also more influential in shaping a range of attitudes, preferences, and economic choices (e.g., Bruine de Bruin & Keren, 2003; Feldman & Lynch, 1988; Karmarkar et al., 2015;

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Mantonakis et al., 2009; Schrift et al., 2018; Weber et al., 2007). In most of the research on sequence effects, the order of information is determined for the decision-maker. But that leaves an unanswered question of what people seek out first when they can choose for themselves. In addition, while manipulating information sequences has clear influences on decision making, these have not been tested for information sequences that are self-selected.

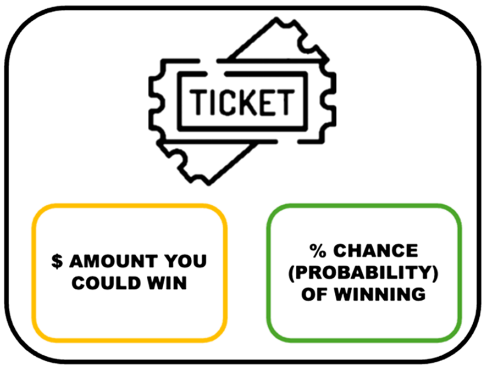
We examine these questions for choices with desirable (rewarding) but uncertain (risky) outcomes. To do so, we designed a sequential information task similar to a "scratch off" lottery ticket where a participant can pick the information they wish to reveal first: the probability of winning the lottery (risk) or the magnitude of the possible payout (reward; Figure 1). Whatever the chosen order, once they have considered both types of information, participants can indicate their subjective value for a ticket.

Attribute Preference and Information Seeking in Risky Gambles

A robust literature examines the relative consideration given to probabilities versus outcomes in risky decision making. Yet the predictions for the preferred order of information seeking in this type of decision are mixed. In some research, a preference for reward information as a choice determinant could be inferred from an increased focus on, or value for, outcomes. For example, foundational work by Lichtenstein and Slovic (1971) on risky choice preferences shows that willingness to pay (WTP) is increased for individual high-outcome bets compared to high-probability bets with similar expected values (EVs). This effect has been robustly replicated, including by Schkade and Johnson (1989), who used mouse tracking to additionally demonstrate that outcome information was accessed more than probabilities overall when evaluating individual bets. The information priority heuristics posited by Brandstätter et al. (2006) similarly suggest people would choose to learn about outcomes before probabilities. Additionally, research on affective dimensions of decision making observes relatively higher weight placed on affective responses to outcomes over cognitive evaluations of risk (Loewenstein et al., 2001) together with finding that people neglect probabilities in affect-rich risk decisions (Rottenstreich & Hsee, 2001; Sunstein, 2003).

Figure 1

Lottery Ticket Task Stimulus as Presented Onscreen to Experiment Participants



Note. See the online article for the color version of this figure.

However, these predictions are not conclusive for our decision setting. For example, since our lottery ticket task may not be considered "vivid" (Loewenstein et al., 2001) or "affect-rich" (Rottenstreich & Hsee, 2001), it is unclear whether the same affective processing-driven mechanisms are significantly engaged. Furthermore, process-tracing experiments employing mouse tracking or eye tracking have found patterns inconsistent with those posited by Brandstätter et al.'s (2006) priority heuristic, with some even suggesting a lack of clear evidence for overall order effects (e.g., Glöckner & Betsch, 2008; Glöckner & Herbold, 2011; Johnson et al., 2008). When estimating WTP for a single gamble, eye-tracking experiments from Alós-Ferrer et al. (2021) found that total fixations for outcomes and probabilities were not significantly different. Finally, Prinsloo et al. (2022) showed that if probabilities are perceived as "too low," people do not want to play a lottery, even if it has a positive EV. This raises the possibility that ensuring a gamble has a "high enough probability" might spur people to examine risk information first.

In light of these varied predictions, our sequential information lottery task (Figure 1) offers the ability to address an open question remaining about risk versus outcome information preferences. A relevant contribution stems from our focus on information selection occurring during the evaluation of a single gamble in the gain domain. This contrasts many of the prior works that have examined how individuals process attributes of risky gambles with monetary outcomes, which frequently involved comparison between two gambles as well as gambles that had mixed gain and loss stakes (e.g., Anderson & Shanteau, 1970; Brandstätter et al., 2006; Fiedler & Glöckner, 2012; Glöckner & Betsch, 2008; Glöckner & Herbold, 2011; Johnson et al., 2008; Lichtenstein & Slovic, 1971; Payne & Braunstein, 1971, 1978; Schkade & Johnson, 1989). While trade-off choices between gain/loss "duplex bets" offer rich settings for decision-making theory, they also require disentangling the roles played by a complex set of process-relevant factors including joint evaluation and forced choice (e.g., Hsee et al., 1999; Lichtenstein & Slovic, 1971; Schkade & Johnson, 1989) as well as integration of gains and losses (e.g., Anderson & Shanteau, 1970; Slovic & Lichtenstein, 1968). The present work takes a step back, offering a simpler "building block" understanding of information-seeking preferences that could be applied to studies of more complex risky choices. It further allows the study of discretionary decisions in which individuals have agency over the decision flow as well as whether they engage with the choice or remain with the status quo.

Potential Mechanisms Underlying Information-Seeking Preferences in Risk

Given the focus of our task on information preference for evaluating a single uncertain prospect, it is useful to consider which cognitive processes this setting might engender. For one, individuals may shape their information-seeking preferences based on prior information or expectations about the parameters of the decision. For example, Einhorn and Hogarth (1985) proposed that when faced with an uncertain prospect, people create an estimate of an unknown probability and then adjust from that anchor to represent their uncertainty.[1]

[1] This anchoring and adjustment mechanism used to inform estimates of unknown information differs from that proposed for preference reversals (e.g., Lichtenstein & Slovic, 1971). The latter reflects anchoring value on specific dimensions of known decision attributes in joint versus separate evaluations.

Thus, expectations of gamble attributes may be another dimension that motivates (or moderates) information-seeking preferences. We test the possible role of reference points and expectations as contributing mechanisms directly in Experiment 2 and in Experiments S1–S2 (Supplemental Materials A and B).

Beyond this, although lottery tickets generally reflect risky gambles, individuals face both unknown outcomes and unknown probabilities in decisions such as our experimental task. Thus, it may be more accurate to describe the setting as ambiguous (e.g., Ellsberg, 1961; Knight, 1921), reflecting the broader uncertainty found in several practical decision contexts. This suggests that behavior in this setting is influenced by the decision-maker's sensitivity to ambiguity, which varies across individuals but is most often some level of aversion (e.g., Berger & Tymula, 2022; Camerer & Weber, 1992; Charness & Gneezy, 2010; Karmarkar, 2023). Given that the decision-maker is aware the information can become available, it additionally creates the "known unknowns" context that would engage comparative ignorance and thus aversion (Fox & Tversky, 1995). A general aversion to ambiguity further yields a prediction that the majority of individuals would choose to learn the probability information first, since they specifically find the knowledge of risk information valuable. This is consistent with the psychological definition of ambiguity from Frisch and Baron (1988), as the experience of missing information relevant to a probability judgment. Revealing the probability of winning would address the aversiveness of the decision by "restoring" the lottery ticket from an ambiguous gamble to a risky one. Following this logic, we propose individual differences in sensitivity to ambiguity as a mechanism underlying information-seeking priorities for risk over rewards and examine this relationship in Experiments 3 and 4.

Decision Consequences of Self-Selected Sequences

Given that individuals will be able to satisfy their information preferences for themselves, will the sequence they select influence their eventual decisions? If the processes evoked are similar to those taking place when the information sequence is exogenously determined, prior findings predict that considering risk information first would decrease perceptions of subjective value (e.g., Millroth et al., 2019). However, there are several factors that leave this in question.

Feelings of increased confidence or certainty have a positive significant economic value when considering ambiguous financial prospects (Peysakhovich & Karmarkar, 2016). Thus, in a situation where a person feels they can fulfill their primary need for information, it could be that the previously observed order effects are diminished or even reversed. It may also be that there is positive value arising from individual agency, control over the decision process, or the satisfaction of carrying out one's preferred goal pursuit (e.g., Deci & Ryan, 1980; Langer, 1975). This benefit could increase optimism about risk (e.g., Gneezy et al., 2020; Langer, 1975), thereby raising the subjective utility of the offered prospect, or could otherwise become integrated in its overall value.

In addition, the effects of viewing risk (or reward) information first may not uniformly decrease value, since these attributes can vary in magnitude. Prior research finds that earlier consideration of attributes can increase their weight in overall evaluations (e.g., Feldman & Lynch, 1988; Johnson et al., 2007; Tavassoli & Lee, 2004; Weber et al., 2007). Therefore, first seeing a high probability of winning could enhance subjective value, while a too-low probability could decrease it, despite a desirable outcome amount (Prinsloo et al., 2022). A similar sensitivity is possible for the magnitude of rewards, where too-low gains could be considered aversive or even insulting (e.g., Thaler, 1988) even if followed by very high win probabilities.

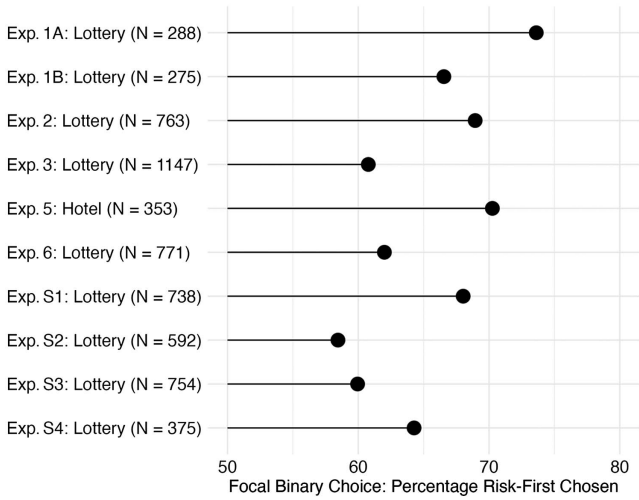
In this research, we examine these questions by employing varied levels of gamble attributes and measuring both purchase decisions and WTP as differing expressions of value perceptions. In line with much of the literature on risky decisions, these measures occur after participants are shown all the attribute information. However, in free choice (discretionary) decisions, people can have agency over both the sequence of information and the ability to withdraw before completing it. Beyond a "no" purchase decision or a zero-dollar WTP, exiting the decision process early offers a distinct behavioral dimension of value perception. Thus, Experiment 6 examines early withdrawal likelihoods to better understand the consequences of people's information preferences as well as gain insight into the overall process.

Overview of the Present Research

In 11 experiments (seven main; four supplemental) conducted across multiple participant populations and platforms, we demonstrate that people do have ordered information-seeking preferences in uncertain choice, with the majority preferring to learn about risks before rewards. A summary of focal binary choice percentages is presented in Figure 2. We first demonstrate this effect and show that it occurs in both incentive-compatible and hypothetical choices using the lottery ticket task (Figure 1; Experiments 1A and 1B). In Experiment 2, we examine whether such preferences might be driven by expectations about the range of values that could plausibly be revealed on the ticket. By providing "example" lottery tickets in the instructions with specific amounts of risk and reward, we are able to manipulate expectations about the gamble attributes, but find these do not moderate the preference to see risk first.

Figure 2

Summary of Percentage of Risk-First Choices in Focal Information-Seeking Tasks



Note. Exp = Experiment.

Experiment 3 provides evidence for our hypothesis that individual sensitivity to ambiguity is a contributing mechanism underlying preferences for risk-first information. Notably, the significant measure of ambiguity sensitivity was defined in terms of missing knowledge about probabilities in a financial decision. It could also be possible that information-seeking preferences can be understood more holistically from the lack of certainty or structure a person faces with the blank lottery ticket. To investigate this, we also explored participants' personal need for structure (PNS; Neuberg & Newsom, 1993; Thompson et al., 2013) but find no predictive power from that measure.

While the initial experiments center on a financial decision context, people similarly look for information about risks and rewards in a range of elective everyday decisions from planning travel or making health decisions to even trying out new foods. The next experiments examine both the robustness and the potential generalizability of risk-first preferences. Experiment 4 shows that interest in viewing risk information dominates interest over rewards even when "diluted" by additional attributes. It further replicates the evidence supporting individual differences in ambiguity aversion as one of the mechanisms driving risk-first preferences. We then show that the preference for risk-first information generalizes to consumer decision contexts with elements of uncertainty about the accessibility of rewards versus the nature of the rewards (Experiment 5).

Finally, we examine whether the majority preferences to view risk first also influence how the choice process unfolds. In addition to having agency over the order of information, participants in Experiment 6 are given the agency to withdraw, by making a continuation choice after the first piece of information is revealed. We find that when able to do so, people who view risk first are also more likely to choose to withdraw from the decision before the full information sequence has been processed. Key details of the full range of experiments are summarized in Table 1.

Transparency and Openness

We report sample size, all data exclusions, all manipulations, and all measures in this experiment and each ensuing experiment. All experiments were preregistered. Preregistration documents, data, analysis code, and research materials for all experiments are available at https://researchbox.org/3235 (Karmarkar et al., 2026). Exploratory preregistered analyses not central to the primary findings are reported in the Supplemental Materials for Experiments 3, 4, and 6. Data were analyzed using StataSE 18.5 (StataCorp, 2024) and R (R Core Team, 2025). Sample sizes were determined in advance and estimated based on ranges used in prior risk research involving online research panels.

Experiment 1A

Our first experiment was designed to test whether people show an overall preference to prioritize viewing risk information or reward information first when faced with an uncertain economic decision. This was operationalized as the lottery ticket illustrated in Figure 1, with incentive-compatible stakes.

Method

We preregistered 300 and obtained 301 participants via an in-person university behavioral laboratory. Participants received class credit as compensation for their time. As preregistered, individuals who did not complete the experiment or were unable to correctly respond to an attention check question were excluded from analysis, resulting in a sample of $N = 288$ (age: $M = 20.71$, $SD = 1.72$, range = 18–30; gender: 46.69% female, 52.96% male, 0.35% nonbinary; one participant declined to provide demographic information).

Participants were endowed with $1 when signing in to a group behavioral lab session. To start this experiment, they were reminded of the endowment and that the lottery would be played for real if they chose to buy a ticket. Following this, they were shown the image of the lottery ticket (Figure 1) with two sections labeled "$ amount you could win" and "% chance (probability) of winning" and were asked to click on a button corresponding to the section they wanted to reveal first. The spatial presentation of the two options was left–right counterbalanced across participants.

After the first piece of information selected was displayed, participants could progress to reveal the other piece. All participants were shown the same complete ticket information regardless of sequence: a possible reward amount of $10 and a 15% probability of winning. At this stage, participants were informed that the price of the ticket was $1 and asked if they wished to buy the ticket (yes or no). Participants completed the experiment with our preregistered attention check question and demographic (age, gender) measures.

At the close of the lab session, each participant's choice was honored individually. If they chose not to buy the ticket, they retained the endowed dollar. If they chose to play the lottery, they had to pay the dollar to a lab research associate who then used the website https://www.random.org to generate an integer from 1 to 100. If the number was less than or equal to 15, the participant won $10. If the number generated was greater than 15, they received nothing.

Results

Following our preregistered analysis plan, we find a 73.61% (212 out of 288) majority of participants chose to view the risk information first (binomial test = 0.50, $p < .001$). A 61.11% (176 out of 288) majority of the participants overall chose to play the lottery. A logistic regression of the decision to play on whether risk was chosen first and the counterbalancing control showed that considering risk first decreased the likelihood of playing the gamble ($b = -0.93$, $p = .002$, 95% CI [−1.52, −0.33], odds ratio [OR] = 0.40, 95% CI [0.22, 0.72]).

This experiment demonstrates that in an incentive-compatible uncertain economic choice, a majority of people prefer to view information about risk (the probability of winning) before reward (the magnitude of the possible payout). This was reflected in their eventual decision; consistent with predictions from prior research, risk-first information sequences were associated with a lower likelihood of paying to play the gamble.

Experiment 1B

In Experiment 1B, we aim to replicate the results of Experiment 1A in a hypothetical setting using a participant pool from an online research platform.

Table 1
Summary of Experiments: Key Questions, Parameters, and Measures

Experiment	Question	Task	Lottery ticket information	Value measure
Experiment 1A: Incentive-compatible lottery	Do people prefer to see risk or reward information first?	Lottery ticket	\$10 with 15% chance of winning	Purchase (yes/no)
Experiment 1B: Lottery	Do people prefer to see risk or reward information first?	Lottery ticket	\$10 with 15% chance of winning	Purchase (yes/no)
Experiment 2: Manipulating expectations	Do expectations about risk and reward magnitudes affect whether people prefer to see risk first?	Reference example (\$10/80% vs. \$100/8%) + Lottery ticket	\$44 with 55% chance of winning	WTP
Experiment S1: Manipulating expectations	Do expectations about risk and reward magnitudes affect whether people prefer to see risk first?	Reference example (\$50/5% vs. \$1/50%) + Lottery ticket	\$10 with 25% chance of winning	WTP
Experiment S2: Measuring internal expectations	Do internal expectations about reward/risk affect whether people prefer to see risk first?	Lottery ticket + Max reward/chance of winning	\$10 with 25% chance of winning	WTP
Experiment 3: Mechanism predicting information choice	Does uncertainty sensitivity predict whether people prefer to see risk first?	Lottery ticket + Ambiguity task + PNS scale	\$100 with 25%/50%/75% chance of winning	WTP
Experiment 4: Gift card three attributes	Does an additional uncertain attribute affect whether people prefer to see risk first?	Gift card risk/retailer/reward + Ambiguity task	\$100 gift card with 40% chance of winning, from the store Target	WTP
Experiment 5: Hotel	Do risk-first preferences generalize to other uncertain marketplace decisions?	Hotel room availability/amenities + Lottery ticket	\$80 with 60% chance of winning	WTP
Experiment 6: Opt-out risk	Does seeing risk information first change the likelihood of opting out of a decision? Is this moderated by risk magnitude?	Lottery ticket with possibility of opting out after first information revealed	\$100 with 10%/90% chance of winning	WTP
Experiment S3: Opt-out reward	Does seeing reward information first change the likelihood of opting out of a decision? Is this moderated by reward magnitude?	Lottery ticket with possibility of opting out after first information revealed	\$1/\$100 with 15% chance of winning	WTP
Experiment S4: Dual tickets	Do risk-first preferences extend to two-alternative forced choice contexts?	Lottery ticket + Choice between two lottery tickets	\$15 with 48% chance of winning + \$5 with 80% versus \$25 with 16%	WTP + Ticket choice

Note. WTP = willingness to pay; PNS = personal need for structure.

Method

We recruited 300 participants from Amazon's Mechanical Turk via the CloudResearch platform using their Approved Participants recruitment parameter (Hauser et al., 2023). A total of 301 responses were logged through this system, and participants received monetary compensation for their time. As preregistered, individuals who did not complete the experiment or were unable to correctly respond to an attention check question were excluded from analysis, resulting in a sample of $N = 275$ (age: $M = 42.78$, $SD = 1.72$, range = 20–77; gender: 52.36% female, 45.82% male, 1.82% nonbinary).

Participants viewed instructions that they should imagine that they had been given $1 that they could use on a lottery ticket. They were further informed, "In this situation you would get to choose how and whether you spend that money." Following this, they went through the same process and information as in Experiment 1A, clicking on the lottery ticket information they preferred to see first and then indicating if they would pay the $1 to play the lottery (yes/no). Participants completed the experiment with our preregistered attention check question and demographic (age, gender) measures. Although participants received monetary compensation for time spent on the experiment, unlike Experiment 1A, the task remained hypothetical and the gamble was not played regardless of the individual's choices.

Results

Following our preregistered analysis plan, a 66.54% (183 out of 275) majority of participants chose to view the risk information first (binomial test = 0.50, $p < .001$). In contrast to Experiment 1A, a 42.18% (116 out of 275) minority of the participants overall chose to play the lottery (binomial test = 0.50, $p = .011$). However, a logistic regression of the decision to play on whether risk was chosen first and the counterbalancing control showed that considering risk first still decreased the likelihood of playing the gamble ($b = -0.61$, $p = .019$, 95% CI [−1.12, −0.101], $OR = 0.54$, 95% CI [0.33, 0.90]). Thus, we replicate the overall results of Experiment 1A, again finding a preference to view risk information first and finding that a risk-first sequence is associated with a decrease in the stated likelihood of playing the gamble.

Experiment 2

Experiments 1A and 1B demonstrated that people do have specific information-seeking preferences in uncertain decisions, regardless of whether their choices are incentive-compatible or hypothetical. In those experiments, no reference points or contextual information about the lottery was offered. However, decision-makers often have their own assumptions and predictions about the kinds of stakes that gambles of this nature would involve that could influence these information preferences and their downstream consequences (e.g., Einhorn & Hogarth, 1985). Experiment 2 provides participants with explicit reference points and investigates whether expectations regarding the potential magnitude of the reward and/or its likelihood influence choices to view risk first.

Method

We recruited 800 participants from Amazon's Mechanical Turk via the CloudResearch platform using their Approved Participants recruitment parameter (Hauser et al., 2023). A total of 804 responses were logged through this system. Participants received monetary compensation for their time. As preregistered, individuals who did not complete the experiment or were unable to correctly respond to an attention check question were excluded from analysis, resulting in a sample of $N = 763$ participants (age: $M = 43.03$, $SD = 12.44$, range = 18–81; gender: 58.79% female, 40.68% male, 0.52% nonbinary; one participant declined to provide demographic information).

In this adapted version of the lottery task (with hypothetical stakes), participants received instructions about the task together with a fully specified example in both the text and in an image. Participants were randomly assigned to one of two example tickets that align with a commonly inferred (e.g., ecologically relevant) inverse relationship between risk and reward (e.g., Pleskac & Hertwig, 2014). Specifically, participants in the high-likelihood/low-prize lottery were shown a ticket where they could win $10 with an 80% chance of winning. Those in the low-likelihood/high-prize lottery were shown a ticket where they could win $100 with an 8% chance of winning. These examples communicate the same EV while manipulating the relative magnitude of the probability and amount information.

On the following page, participants engaged in the same overall lottery task as Experiments 1A and 1B (Figure 1). Spatial presentation of the two options was left–right counterbalanced across participants. All participants saw the same target lottery ticket with a 44% probability of winning and $55 potential reward when the full information was revealed. Of note, this information is equally "distant" from both example tickets: There is a difference of 36% for the probabilities (i.e., 80%–44% and 44%–8%) and a difference of $45 for the reward (i.e., $100–$55 and $55–$10). Once the full set of attributes of the main ticket was revealed, an estimate of the lottery's subjective value was elicited by asking participants for their WTP. At the end of the experiment, participants were asked to evaluate the information on the main ticket as follows: "Regarding the [amount of money ($55) | chance of winning (44%)] on the lottery ticket that you were assigned, how does it align with your expectations?" These two questions were aimed at assessing whether the initial examples influenced participants' expectations of the magnitude of the potential reward and its likelihood before their ticket's information was revealed.

Results

Following our preregistered analysis plan, we found that 69.71% of participants (267 out of 383) chose to view the risk information first in the high-likelihood/low-reward condition (binomial test = 0.50, $p < .001$). Similarly, 68.16% of participants (259 out of 380) chose to view the risk information first in the low-likelihood/high-reward condition (binomial test = 0.50, $p < .001$). As these percentages suggest, manipulating lottery expectations did not affect what information participants chose to view first, $\chi^2(1) = 0.22$, $p = .643$. For completeness, pooling across conditions, the percentage of risk-first choices was 68.94% (binomial test $p < .001$).

To examine how self-selected information sequence might influence value, we conducted a regression analysis examining the relationship between WTP and lottery expectations (*high-probability/low-reward condition* = 1 vs. *low-probability/high-reward condition* = 0), information chosen first (e.g., risk first), and a control for left–right information presentation. Paralleling the results

of Experiments 1A and 1B, viewing risk first led to a decrease in WTP ($b = -2.41$, $p = .003$, 95% CI [−3.97, −0.84], $\eta_p^2 = 0.012$, 95% CI [0.001, 0.032]). Neither the expectation condition ($b = -1.12$, $p = .127$) nor the information lateralization ($b = 0.52$, $p = .484$) showed a main effect relationship with WTP. However, as illustrated in Figure 3, replicating this analysis with the inclusion of an interaction term between lottery expectations and the order of information shows that the (negative) effect of choosing risk first on WTP appears driven by the low-likelihood/high-prize expectation ($b = 3.14$, $p = .047$, 95% CI [0.04, 6.24], $\eta_p^2 = 0.005$, 95% CI [0.000, 0.020]).

An important element for interpreting these findings is confirming that the manipulation affected participants' expectations in a way that influenced perceptions of the target lottery. To do so, we took measures of how well the observed ticket reward ($55) and ticket probability (44%) aligned with participants' expectations, on a 5-point scale from *much lower than expected* to *much higher than expected*. Regressing the alignment rating for rewards on the expectation condition confirmed that participants who saw the high-likelihood/low-reward example found the target lottery amount of $55 to be higher than expected compared to those who saw the low-likelihood/high-reward example ($b = 0.37$, $p < .001$, 95% CI [0.24, 0.50]). Conversely, regressing the alignment rating for probability demonstrated that participants in the high-likelihood/low-reward condition found the 44% chance of winning to be lower than their expectations ($b = -0.76$, $p < .001$, 95% CI [−0.89, −0.63]). As further illustrated in Figure 4, this manipulation check provides evidence that exposure to the example information prior to the task did successfully influence expectations for the task itself.

Finally, a logit analysis examining the relationship between information chosen first based on expectation condition, expectation alignment ratings of the outcome, and expectation alignment ratings of the likelihood found that none of these factors had a statistically significant impact on what participants chose to view first (all p values $> .05$). Specifically, the lottery example viewed as part of the instructions had no effect on the subsequent information choice ($b = 0.026$, $p = .491$). We can consider the effects using the expectation alignment ratings measured after the main task as a proxy for expectations held before the information was revealed. This shows there was similarly no relationship between the preference to see risk first and the measures related to outcome alignment ($b = -0.018$, $p = .344$) or probability alignment ($b = 0.005$, $p = .807$).

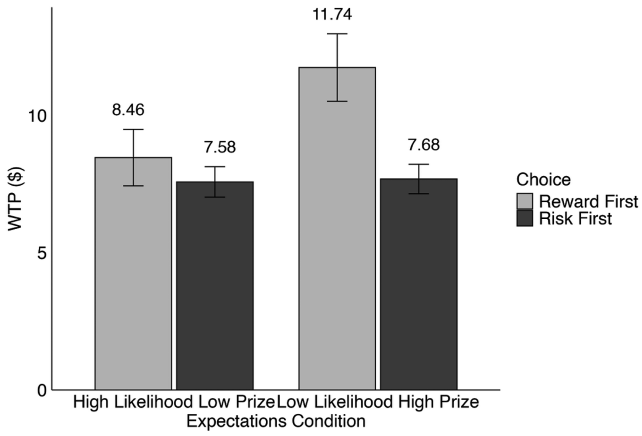
Overall, we replicate a preference for viewing risk information first in uncertain risk–reward settings. We also show this preference is not significantly affected by varying reference points or expectations about the magnitude of risk or reward and replicated this finding in Experiment S1 (Supplemental Material A). While these studies manipulated expectations by externally providing reference points, they do not speak to whether internal expectations might play a role. In Experiment S2 (Supplemental Material B), we elicited participants' own anticipated risks and rewards without any reference points provided and show that estimations of these attributes do not significantly differ between individuals who choose to see risk versus reward first.

The present experiment and Experiment S1 (Supplemental Material A) used the same task design, but with differing attribute magnitudes in the example tickets. As a result, the EV of the example tickets varied across the experiments. While comparing risk-first preferences across EVs showed no significant differences between Experiment 2 and the replication ($p = .74$), the present work leaves open the question of whether large variations in anticipated EV could moderate information preferences distinctly from differences in individual risk/reward attributes.

These two experiments both also show that risk-first sequences can be associated with a lower subjective value for the gamble. In the present experiment, this overall effect is enhanced by an *increase* in WTP for people who view a lower-than-expected outcome first and then view a higher-than-expected probability afterward (Figure 3). This offers the possibility that expectations or reference information may exert some influence at the full information evaluation stage, rather than the preceding information selection stage.

Figure 3

Experiment 2: WTP for Lottery Ticket



Note. WTP = willingness to pay.

Experiment 3

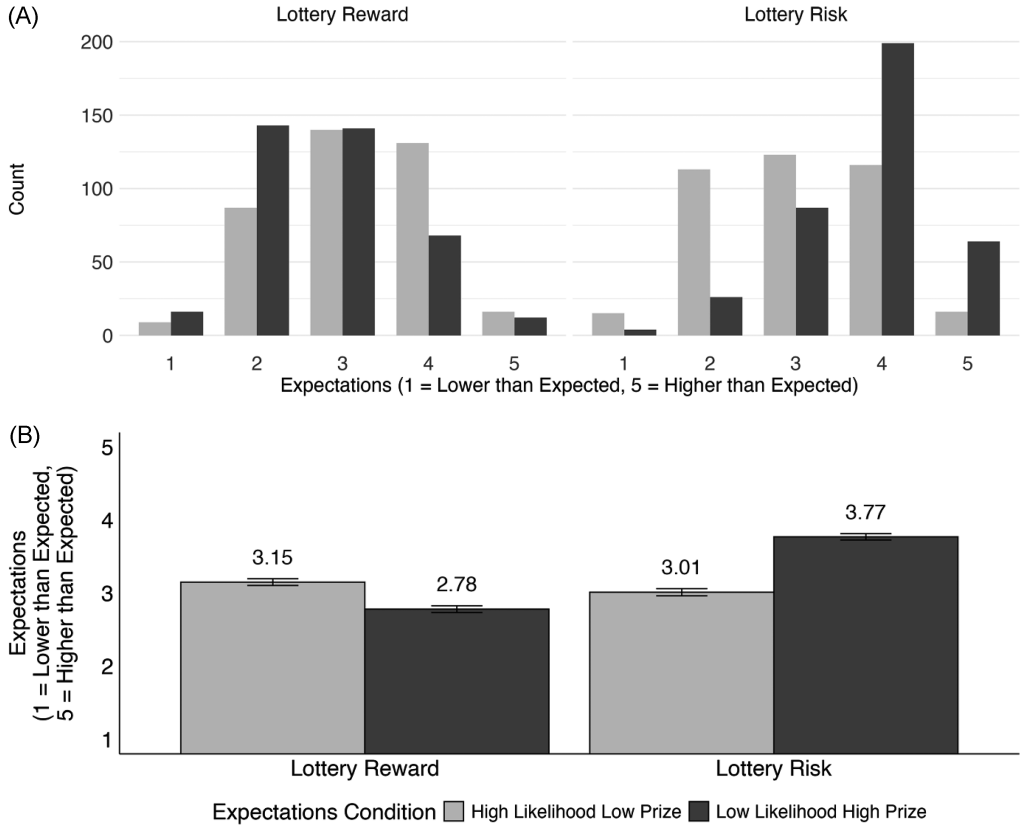
While our findings demonstrate a majority preference for viewing risk first, the effect is not uniform—there are a meaningful number of individuals who choose to view outcome information first (or who perhaps do so out of indifference). This suggests that these preferences may rest on individual differences in how this information is processed. As discussed in the introduction, we propose that sensitivity to the absence of risk information in particular (i.e., ambiguity aversion) is a likely candidate. Experiment 3 thus examines sensitivity to ambiguity as a mechanism that might drive preferences for risk, as well as individual differences in PNS more generally. In addition, Experiment 3 tests the effect of varying lottery ticket probabilities between subjects to examine whether the downstream impact of self-selected sequences on perceived value depends on the relative chances of winning.

Method

We recruited 1,200 participants from Amazon's Mechanical Turk via the CloudResearch platform using their Approved Participants recruitment parameter (Hauser et al., 2023). A total of 1,202 responses were logged through this system. Participants received monetary compensation for their time. As preregistered, individuals

Figure 4

Experiment 2: Expectations for Lottery Ticket Attributes



Note. Panel A shows the frequency distributions of participant ratings for reward (left) and risk (right). Panel B shows the average reported expectations of lottery ticket attributes for reward and risk across conditions.

who did not complete the experiment or were unable to correctly respond to an attention check question were excluded from analysis, resulting in a sample of $N = 1{,}147$ participants (age: $M = 42.23$, $SD = 13.42$, range = 18–89; gender: 53.62% female, 45.16% male, 1.22% nonbinary).

In this lottery task with hypothetical stakes, participants were asked to "Imagine that you have the chance to enter into a lottery. The computer randomly generates a new kind of ticket for each person." They were shown the same initial lottery ticket image from the prior experiments and were asked to click on a button corresponding to the section they wanted to reveal first. Spatial presentation of the two options was left–right counterbalanced across participants.

After the first piece of information selected was displayed, participants could progress to reveal the other piece. However, in this experiment, participants were randomized into one of three probability conditions displayed on the ticket (25%, 50%, 75%). All saw the same potential reward magnitude of $100. Once the full risk/reward information was revealed, participants were asked for their WTP on a slider scale from $0 to $100.

To unpack potential mechanisms dividing the groups who choose risk versus reward first, we tested whether risk-first preferences could arise from two possibly relevant individual difference factors related to uncertainty. For the first of these, participants engaged in an ambiguity sensitivity task based on drawing a specific color of poker chip from a bag with 100 chips, adapted from the Pro/Con task (e.g., Peysakhovich & Karmarkar, 2016). Participants were told that they would play two rounds of a hypothetical lottery game in which every chip in the bag was either red or blue. When the game is played, one chip would be drawn; if the chip drawn is red, the player wins $50, and if it is blue, the player receives nothing. Participants were also informed that they would receive varying amounts of color information in each independent round and that they would be asked their WTP for a ticket to play the game. Participants then answered three questions to demonstrate their comprehension of the instructions.

In the first game round of this ambiguity task, participants were given full probability information (50 red chips and 50 blue chips). In the second round, they were told, "You know nothing about how many of the chips are RED or how many of the chips are BLUE in the bag in front of you." These rounds represent a fully risk-based gamble and a fully ambiguous gamble, respectively, allowing an estimation of ambiguity sensitivity by subtracting the WTP for the ambiguous gamble from the risky one. In other words, the greater an individual's WTP for a known 50/50 gamble compared to their WTP for a gamble with a completely unknown composition, the greater their sensitivity to ambiguity.

While the simplified Pro/Con task focuses on economically (and numerically) defined sensitivity to ambiguity, it could be that a more subjective expression of a person's need for clarity or structure

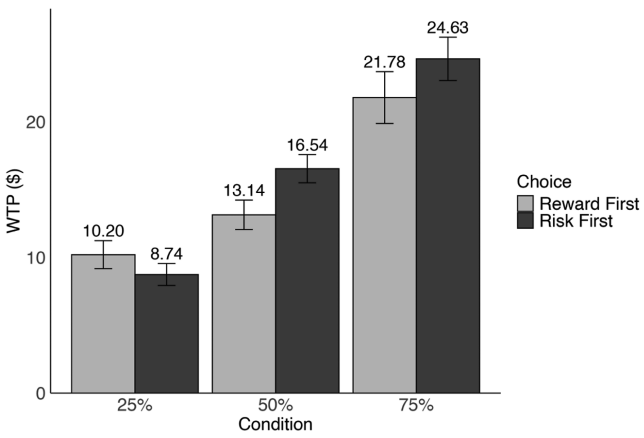
better captures the motivations underlying information-seeking preference. Accordingly, participants also completed the 12-item PNS scale (Neuberg & Newsom, 1993; Thompson et al., 2013) and finished the experiment with our preregistered attention check question and demographic (age, gender) questions.

Results

In line with the prior experiments, a 60.77% majority chose to see the probability (risk) information first over the reward information (binomial test = 0.50, $p < .001$). As noted, while this proportion is significant, there remains a meaningful population who selected reward first. To unpack the factors that might underlie such variance in people's preferences, we examined two measures of how they relate to uncertain situations. First, for each participant, we estimated sensitivity to ambiguity in the Pro/Con task by subtracting WTP in the ambiguity trial from the risk trial. On average, this value was positive ($M = 3.68$, $SD = 5.87$), demonstrating overall significant ambiguity aversion, $t(1042) = 20.24$, $p < .001$. As per the preregistration, we conducted a logit regression of a binary risk-first choice variable on the ambiguity measure, and we further excluded participants if they answered one or more of the ambiguity task instruction comprehension questions incorrectly. We include controls for spatial counterbalancing and gender (with separate regressors for female and nonbinary responses). Using these constraints, we find predictive effects of ambiguity sensitivity to risk-first information seeking ($N =$ 1,043; $b = 0.04$, $p = .001$, 95% CI [0.02, 0.06], $OR = 1.04$, 95% CI [1.02, 1.07]). In contrast, the preregistered exploratory logit of choice on the PNS scale suggests that the subjectively defined preferences for certainty that it measures do not predict the information-seeking preferences in this task ($p = .737$; additional details provided in Supplemental Material E).

Finally, we examined how differences in the probability of winning the lottery gamble might interact with risk versus reward-first preferences in shaping subjective value as measured by WTP (Figure 5). Following the preregistered analysis, regressing WTP on the probability of winning, a binary variable indicating whether risk was viewed first, their interaction, and controls for spatial counterbalancing and gender indicated that overall participants did adjust their subjective value as the probability of winning information increased ($b = 0.24$, $p < .001$, 95% CI [0.16, 0.32], $\eta_p^2 = 0.09$, 95% CI [0.06, 0.12]). This indicates that they were attending to, and sensitive to, the risk information. In this experiment, the order of information did not have a significant effect on WTP ($b = -2.69$, $p = .335$). Despite magnitude-sensitive variance in the responses, the interaction between probability of winning and risk first was not significant ($b = 0.08$, $p = .134$). Overall then, it may appear inconsistent with effects observed in Experiments 1 and 2. However, we elaborate further on these relationships in the General Discussion section.

Figure 5
Experiment 3: WTP for Lottery Ticket



Note. WTP = willingness to pay.

Experiment 4

Experiment 4 examines how the majority preference for early access to risk information might be affected by an expanded attribute space. Whether approaching uncertainty from the perspective of classically defined expected utility or by the subjective perspective of utility (e.g., Kahneman & Tversky, 1979), prior research in this space of decisions generally focuses on risk and reward as the two primary attributes of interest. However, the scope of information can be much more complex in practical decision making both in terms of the quantity of attributes and their qualitative nature. As one example, win probability and monetary reward can be considered vertical attributes in which increases in magnitude have objective benefits. It is also possible to include horizontal attributes whose value may depend on subjective preferences (e.g., whether a physical item is available in green or blue). Here, we extend our lottery task to include a horizontal third attribute: Participants consider a lottery for a gift card and can choose to first learn the name of the retailer in addition to the amount of money on the gift card and the probability of winning it. We further examine whether ambiguity aversion continues to serve as a useful predictor of preferences in this extended attribute space.

Method

We recruited 700 participants from the Prolific platform, which yielded 703 responses to the experiment. Participants received monetary compensation for their time. As preregistered, individuals who did not complete the experiment or were unable to correctly respond to an attention check question were excluded from analysis, resulting in a sample of $N = 653$ participants (age: $M = 37.34$, $SD = 12.20$, range = 18–81; gender: 50.08% female, 48.39% male, 1.53% nonbinary).

Participants first engaged in a hypothetical adapted version of the lottery task (Figure 6), in which they viewed a ticket for a gift card that had three fields of information—risk, retailer, and reward. The retailer field was always presented in the center, while spatial presentation of risk and reward was randomly left–right counterbalanced across participants. Participants were asked to click a button representing the piece of information they would prefer to see first.

After the information selected was displayed, participants progressed to reveal other fields. Since the focus was on which information would be chosen first, the remaining two pieces of information were displayed together at this time. All participants saw a final ticket representing a 40% chance of winning a gift card to the retailer Target with a $100 value. After the full information was revealed, participants were asked "How much would you be willing to pay (in dollars and cents) to buy the ticket and play this lottery?"

Figure 6

Lottery Ticket Stimulus for Experiment 4 Featuring Risk, Reward, and Also Retailer Fields

Note. See the online article for the color version of this figure.

and responded on a slider scale from $0 to $100. Participants then engaged in the same ambiguity instrument task as described in Experiment 3. Finally, they completed our attention check question and demographic measures.

Results

We find that the proportions of individuals who chose risk first (43.49%), amount first (38.28%), or retailer information (18.22%) were significantly different from an even distribution, $\chi^2(1) = 69.74$, $p < .001$. Considering only choices of risk and reward, a 53.18% majority chose risk (binomial test = 0.50, $p = .153$). Extending beyond the preregistered analyses, we can replicate the exclusion criteria from Experiment 3 (excluding participants who answered one or more of the ambiguity task instruction comprehension questions incorrectly), which yields a sample size of $N = 589$. Using this conservative sample to test the proportions of individuals who chose risk, amount, or retailer first, we see the same significant deviation from an even distribution, $\chi^2(1) = 68.97$, $p < .001$. With these exclusions, considering only choices of risk and reward, a clear majority (55.28%) chose risk (binomial test = 0.50, $p = .023$). Consequently, while the presence of additional attributes creates some "dilution" of behavior, there does still appear to be a preference for learning risk first.

Comparable to Experiment 3, the measure of ambiguity sensitivity was positive on average ($M = 3.57$, $SD = 6.14$), reflecting an aversion to ambiguity overall, $t(588) = 14.12$, $p < .001$. A logit regression of risk-first (vs. the pooled retail/reward first) choice on ambiguity sensitivity shows that it is a significant predictor of choosing risk first ($b = 0.05$, $p < .001$, CI [0.02, 0.08], $OR = 1.05$, 95% CI [1.02, 1.08]). Preregistered logistic regressions with reward (choice of gift card amount) versus the other two options actually had the opposite effect ($b = -0.05$, $p = .002$, 95% CI [−0.08, −0.02], $OR = 0.95$, 95% CI [0.92, 0.98]), whereas there was no relationship between choosing retail and simple ambiguity ($p = .433$). While all three attributes represent potential sources of uncertainty, ambiguity aversion appears to specifically enhance probability information over the qualities of the reward.

We also preregistered a regression for WTP, with separate variables for choice of risk first ($M = 13.52$, $SD = 15.57$) and choice of retail first ($M = 15.13$, $SD = 18.45$), using choice of outcome first ($M = 13.81$, $SD = 16.83$) as the baseline. As the means suggest, the information chosen first did not influence WTP (risk: $p = .916$; retail: $p = .451$).

Experiment 5

The lottery ticket experiments have demonstrated largely consistent information preferences in decisions with financially defined rewards. Building on this, it would be useful to understand whether such information preferences are relevant for other types of marketplace decisions in which people can look at information that clarifies uncertainty before or after understanding the nature of the possible benefits. As one such case, Experiment 5 explores whether consumers faced with uncertainty about booking a hotel room prioritize learning information about the likelihood of getting a room (i.e., risk) over the quality or benefits of the room itself (i.e., reward). In addition, this design allows an understanding of whether the horizontal versus vertical nature of the reward attribute itself could moderate early preferences for risk information. Specifically, while availability of the room is again a vertical attribute, hotel room amenities are likely a horizontal attribute, with subjective values and importance that vary across individuals.

Method

We recruited 400 participants from the Prolific platform, yielding 402 survey responses. Participants received monetary compensation for their time. As preregistered, individuals who did not complete the experiment or were unable to correctly respond to an attention check question were excluded from analysis, resulting in a sample of $N = 353$ participants (age: $M = 36.10$, $SD = 11.80$, range 18–77; gender: 49.29% female, 49.29% male, 1.42% nonbinary).

As their focal task, participants were presented with the following hypothetical scenario:

> Suppose you feel like you need to take a break. Luckily, there is a particular week coming up when you can take time off from your daily responsibilities, but only for 2 specific days. You start looking at nearby options for a local getaway, just to get a change of scenery, and find a promising hotel.

Participants were then asked "Which information would you want to know about first?" and selected either "Availability for your 2 open days" (risk) or "Room pictures and descriptions, and hotel amenities" (reward). After this choice, participants were able to view the full information and indicate their WTP for the room using a fill-in-the-blank open response.

Following the scenario, participants also completed the lottery ticket task. Spatial presentation of the two options was left–right counterbalanced across participants. All participants were presented with a 60% chance of winning $80 as the full ticket information and were asked to indicate their WTP for the ticket on a slider scale of $0–$80.

Results

Following our preregistered analyses, a majority of the individuals in the experiment chose to view the availability information prior to the hotel amenities (70.25%, binomial test = 0.50,

$p < .001$). Similarly, replicating the prior findings, a majority chose to view the risk information first on the lottery ticket task (58.07%, binomial test = 0.50, $p = .001$). We conducted the preregistered chi-squared test of a relationship between the hotel decision and lottery decision and found that individuals who chose risk in one setting were more likely to do so in the other, $\chi^2(1) = 6.71$, $p = .010$. For further robustness, we also performed a logistic regression of risk-first preference in the lottery ticket on risk-first hotel room information with a control variable for information lateralization. This demonstrated a significant relationship between the preferences for risk in the hotel choice and in the lottery task ($b = 0.62$, $p = .009$, 95% CI [0.15, 1.08], $OR = 1.85$, 95% CI [1.16, 2.94]).

We additionally tested the potential relationship between information choice and WTP. Our preregistered analysis of WTP for the hotel room (risk first: $M = 178.58$, $SD = 138.17$; reward first: $M = 184.27$, $SD = 94.50$) regressed on information choice failed to show a relationship ($p = .700$). The preregistered regression of WTP for the lottery ticket (risk first: $M = 17.03$, $SD = 15.25$; reward first: $M = 14.95$, $SD = 15.69$) on information choice was similarly not significant ($p = .217$).

These findings demonstrate that the preferences for likelihood information observed in the lottery ticket task can indeed generalize to other forms of marketplace decision making. As such, they contribute not only to a psychological understanding of everyday behavior but also to practical insights for understanding how people navigate commercial choice interfaces.

Experiment 6

Our results suggest that self-selected information sequences can be informative about the decision value of the prospect (though this has varied when participants estimate their own value-based price as WTP). By design, such value judgments occurred once participants had considered all of the available information. But the sequential nature of such decisions also allows a person's intermediate perceptions to shape the process *and* any ensuing decisions. Specifically, the first piece of information could "gate" a person's decision flow, by influencing whether they make a choice early and opt out (declines the prospect) or continue with the process to make a choice after learning all the information. This ability to opt out is effectively also a communication of the subjective value for the gamble. Since the dominant choice in our experiment is to consider risks before rewards, Experiment 6 tests how the preference for probability first can alter the decision process.

Given that early attention to risk can diminish the value of a gamble as seen in Experiments 1A, 1B, 2, S1, and S2, as well as prior research (Millroth et al., 2019), we predict that participants are more likely to withdraw if they choose to see risk information first. We further explore whether such an effect might be moderated by the specific odds of winning and examine this for probabilities that are relatively low (10%) or high (90%). These probabilities were chosen to be symmetrical, in that they communicate the same degree of "definitiveness" about a loss or a win (e.g., Keren & Teigen, 2001).

Method

We recruited 800 participants from the Prolific platform, which yielded 801 observations. As preregistered, individuals who did not complete the experiment or were unable to correctly respond to an attention check question were excluded from analysis, resulting in a sample of $N = 771$ (age: $M = 38.20$, $SD = 11.99$, range 18–77; gender: 48.64% female, 49.16% male, 1.56% nonbinary, 0.65% prefer to self-describe).

In this hypothetical lottery task, participants were asked to "Imagine that you have the chance to enter into a lottery. The computer randomly generates a new kind of ticket for each person." Participants were randomized into one of two win-probability conditions (10% or 90%) with the potential reward of $100 held constant. They were shown the lottery ticket image from Figure 1 and clicked a button corresponding to the section they wanted to reveal first. Spatial presentation of the two options was left–right counterbalanced across participants.

After the first piece of information selected was displayed, participants were asked to choose whether they wished to continue with the decision or withdraw (e.g., "View the rest of the information," "Decline to buy the ticket"). Participants who withdrew (declined) completed the demographic and attention measures and ended the survey. Participants who continued viewed the complete risk/reward information and indicated WTP for the ticket on a scale from $0 to $100.

Results

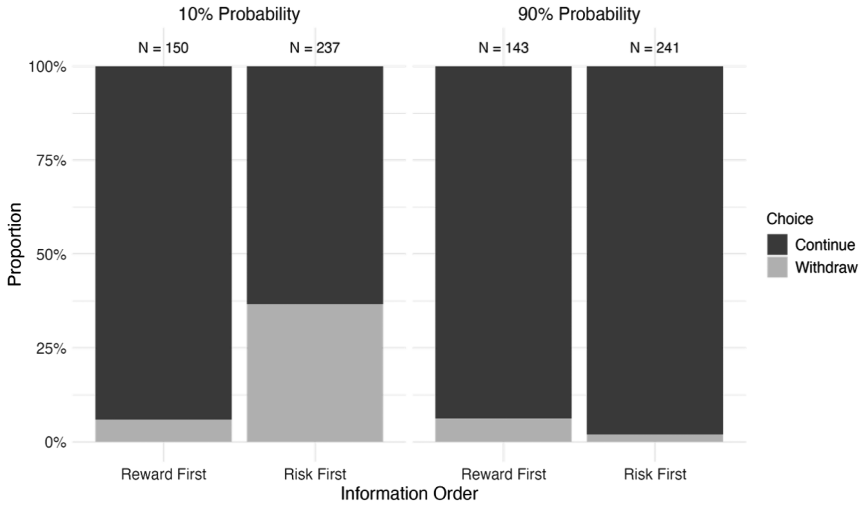
Collapsing across the 10% and 90% conditions, the majority preference for risk first replicated again in this experiment, with 62.00% (478 out of 771) choosing risk (binomial test = 0.50, $p < .001$). Considering the same probability-pooled sample shows that individuals who viewed risk first were more likely to withdraw from the decision prior to seeing the full information (risk = 19.25%, reward = 6.14%), $\chi^2(1) = 25.50$, $p < .001$. The proportion of choices broken down by condition is reported in full in Figure 7. As this illustrates, more people declined the ticket in the 10% probability condition (24.81%) compared to the 90% probability condition (3.65%), $\chi^2(1) = 70.56$, $p < .001$. Examining each condition separately demonstrates that in the low (10%) condition, the proportion of withdrawal is significantly higher when risk is seen first, $\chi^2(1) = 46.44$, $p < .001$. Notably, in the high (90%) condition, this effect technically reverses such that withdrawal is significantly lower if risk is seen first, $\chi^2(1) = 4.55$, $p = .033$. Interpreting the latter effect must of course be qualified by the extremely low levels of withdrawal overall for the 90% ticket.

We can extend beyond our preregistered analyses to a more conservative test, namely, a logistic regression also controlling for spatial presentation of the information, which finds a significant interaction between choice of risk and magnitude of revealed probability ($b = 3.36$, $p < .001$, 95% CI [2.03, 4.69], $OR = 28.89$, 95% CI [7.65, 109.03]) on the decision to continue. In other words, the impact of risk information on decision engagement is indeed related to the specific probability of winning.

The subsample of the participants ($N = 661$) who chose to view the full lottery information also indicated their WTP for the ticket (10% condition: $M = 7.82$, $SD = 14.94$; 90% condition: $M = 31.01$, $SD = 27.93$). As preregistered, we regressed their WTP on the probability of winning (0 = *10%*; 1 = *90%*) and a binary risk-first choice variable, which confirmed that WTP significantly increased with increases in the probability of winning ($b = 22.86$, $p < .001$, 95% CI [19.28, 26.45], $\eta_p^2 = 0.19$, 95% CI [0.14, 0.24]). Although that result indicates participants integrated the probability information in their perception

Figure 7

Experiment 6: Frequencies of Participant Withdrawal After Viewing the First Piece of Information Selected



of value, risk-first choice did not have a significant impact on WTP ($b = 2.66$, $p = .149$). It is necessary to qualify this result by restating that the significant number (>100) of people who withdrew early are not captured in this measure.

Given our findings that a majority of people preferred to see risk information first, the purpose of this experiment was to illustrate the consequences of that preference on "gating" downstream choice. We find individuals who choose to see probability first are more likely to withdraw early from a decision and also that withdrawal is moderated by the magnitude of that probability. This raises the question of whether the magnitude of the reward can similarly influence likelihood of withdrawal for the individuals with reward-first preferences. To address this, we conducted Experiment S3 (Supplemental Material C), which parallels the design of the present experiment but holds probability constant at 15%, while manipulating the win amount as $1 or $100. We replicate both the majority risk-first preference and the increased likelihood of decision withdrawal for risk first versus reward first for the 15% (low likelihood)/$100 gamble. However, we observe that for participants who choose reward first, decision withdrawal is significantly higher when the amount is $1 versus $100 ($p < .001$). Thus, the reward amount, if low enough, can gate willingness to evaluate as well.

General Discussion

Whether considering the purchase of shares of a promising stock or the effort of trying to get travel reservations, a wide range of decisions involve considering information about the likelihood and magnitude of a desired outcome. Across 11 experiments (seven main; four supplemental), we find convergent evidence that a majority of people prefer to learn information about risks before they learn about the scope of rewards (Figure 2). Conducting an internal meta-analysis across these experiments demonstrates that this preference is robust across the variations in experimental designs aimed at exploring different facets of its expression, with an overall model estimation of 65.11% preferring risk first ($p < .0001$; see Supplemental Material F for full reporting of methods and results). Furthermore, we find this selection of "risk-first" generalizes from a clearly defined economic task to decision settings such as making hotel room reservations, emphasizing that the effect could be recognized in commercial or public applications to support people's preferred decision flows.

An extensive literature exists on how people attend to and integrate the attributes in risky decisions. This body of work can be interpreted as yielding a range of predictions for which information would be prioritized in our task. For example, gamble evaluations in several studies suggest a preference for viewing rewards first when considering single gambles (e.g., Lichtenstein & Slovic, 1971; Schkade & Johnson, 1989) or multiple ones (Brandstätter et al., 2006). There is also contrasting evidence suggesting that people prefer to compare between gambles by attending to risk first (e.g., Fiedler & Glöckner, 2012; Payne & Braunstein, 1978), though process-tracing research from mouse and eye tracking additionally yields mixed predictions or the absence of a clear difference in attention spent on risk versus reward (Alós-Ferrer et al., 2021; Glöckner & Betsch, 2008; Glöckner & Herbold, 2011; Johnson et al., 2008). At a surface level, our findings might be considered an additional piece of evidence supporting the risk-first predictions. However, they may offer a more generative contribution when considered as an insight into a distinct component of decisions about risk.

To explore this contribution, it is useful to consider that much of the cited literature on risky choice behavior employs comparisons between two (or more) gambles. These multioption choices additionally impose a requirement for decision-makers to make a selection involving some form of uncertainty (e.g., forced choice). This raises the question of whether the risk-first preferences for a single option can offer a building block for understanding behavior in more complex decision architectures. Supporting this, preliminary evidence suggests that information-seeking preferences when evaluating one option predict information seeking in choices between options. In a pilot experiment, participants ($N = 375$; university lab, S4, Supplemental Material D) first engaged in the lottery ticket task and then viewed two

side-by-side tickets simultaneously (with an eventual goal to select one). The majority risk-first preferences for the single ticket (64.27%) were significantly associated with risk-first preferences for the between-ticket choice (63.47%), $\chi^2(1) = 106.18$, $p < .001$. This relationship suggests the benefits of our finding as an elementary component or starting point for understanding the impact of additional decision attributes and configurations.

Even when evaluating a single bet, participants in prior research are often faced with both a gain and loss component whose attributes require at least comparison if not integration. In contrast, our task models discretionary decisions in a single (gain) domain. This is relevant not only for monetary decisions like bets but also for a range of everyday choices where people are deciding whether or not to "opt-in" to an uncertain offer, with the status quo as a default. We propose that the choice of which attribute to view first reflects the type of information people see as most helpful, informative, or useful in engaging with the choice. This motivation is consistent with the behavior in Experiments 6 and S3, where exposure to a low value on the preferred attribute was sufficient to make a decision about the ticket as a whole. Similarly, the desire to prioritize the attribute that signaled if the gamble was "worth it" was expressed in participant self-reports in Experiment S3 (Supplemental Material C).

Affect-based mechanisms of risky choice might suggest that outcomes are the most engaging elements of risky choice (e.g., Loewenstein et al., 2001; Rottenstreich & Hsee, 2001; Sunstein, 2003), predicting that this attribute would be selected first. In an explicitly gain-domain setting, though, people might enjoy positive affect arising from the possibility of a large prize (Mellers et al., 1997; Slovic et al., 2005). If so, people could choose to view risk first to "keep hope alive" or savor this anticipation (e.g., Loewenstein & Prelec, 1993). Such a mechanism would predict that individuals who choose risk first would be looking forward to the possibility of a greater reward magnitude than individuals who choose to see reward first. However, participants in Experiment S3 (Supplemental Material C) reported comparable estimates for the maximum reward they might receive, arguing against this mechanism for selecting risk first.

Taking a different approach, despite the consistent direction of results across experiments, the preference for risk information first is not uniform. This suggests a role for individual differences in defining which information might be subjectively weighted as "most informative" for the decision. In Experiment 3, we tested whether one such mechanism might be individual differences in sensitivity to uncertainty. We show that choosing to see probabilities over reward first is significantly associated with higher aversion to financially defined ambiguity. However, it is not related to a more general need for structure in the same participants. We thus propose that more ambiguity-averse individuals find it specifically appealing to learn about the probability of the desired outcome, both as a useful first criterion to evaluate the gamble and as a way to "flatten" that dimension of uncertainty, making the decision risk-based instead of ambiguous.

Supporting this mechanism, in Experiment 4, when a qualitatively distinct third attribute was included in the lottery task, preferences to view risk information first continued to be predicted by participants' sensitivity to ambiguity. Notably, while ambiguity aversion was associated with an increased preference to see risk first and a decreased preference to see reward first, it had no relationship with the selection of retailer information first. This speaks to the likelihood that information-seeking preferences are multiply determined, suggesting benefits of exploring a wider portfolio of mechanisms to understand motivations related to other possible choice attributes.

Information Preferences and Subjective Value

In a range of prior research on order-dependent information-processing effects (e.g., Anderson, 1973; Bruine de Bruin & Keren, 2003; Feldman & Lynch, 1988; Karmarkar et al., 2015; Lopes & Ekberg, 1980; Mantonakis et al., 2009; Millroth et al., 2019; Schrift et al., 2018; Weber et al., 2007), the option or attribute sequences offered to participants are predetermined and assigned. A novel contribution of the present work to the sequential processing literature is that decision-makers actively choose the information they wish to learn first. As a result, our findings additionally address the question of whether an individual's agency, or ability to pursue their own information preferences, would have the same effects on choice as when an information sequence was determined for them.

In Experiments 1A and 1B, selecting to view risks before rewards reduced the likelihood that the decision-maker would spend a fixed amount of money (i.e., a "price") on the lottery ticket. This is consistent with the diminished certainty equivalent estimated for risk-first ordered gambles observed in Millroth et al. (2019). Although risk-first preferences similarly decreased WTP in some experiments, this did not reach significance in all studies where it was measured. To better synthesize these findings, we conducted an "integrative data analysis" (e.g., Curran & Hussong, 2009) on the experiments using binary-field lottery tickets (Experiments 2, 3, 5, and 6 and Experiments S1–S4 in Supplemental Materials). Full methodological details and model tables are reported in Supplemental Material F (WTP). Controlling for the magnitude of risk and reward attributes, the models showed that viewing risk first was indeed associated with a decrease in WTP (e.g., Model 3; $b = -2.642$, $SE = .903$, $p < .01$).

The WTP analysis also demonstrates a significant positive interaction of risk-first and probability magnitude (Model 3: $b = .063$, $p < .002$), but not risk-first and reward magnitude ($p = .721$). This provides useful insight into the qualitative variation of the effects. Indeed, this interaction reflects the patterns observed for WTP as risk probabilities increase in Experiment 3 (Figure 5). While risk-first preferences decrease valuation overall, higher probabilities of winning increase it, with WTP reflecting the integration of these factors.

Our results further allow us to draw together aspects of prior work on both order effects and risk processing. Beyond the decreased subjective value when risk information is processed first (Millroth et al., 2019), attributes attended early in a sequence have been shown to receive increased weight in evaluating other types of options (e.g., Feldman & Lynch, 1988; Johnson et al., 2008; Tavassoli & Lee, 2004; Weber et al., 2007). This weighting can be considered similar to anchoring and adjustment theories of risk processing (e.g., Lichtenstein & Slovic, 1971; Schkade & Johnson, 1989), in which early consideration of information allows it to anchor subjective value estimates, thus also receiving more weight. Our research also finds that attention to risk first increases the influence of probability information on subjective value. However, the dependence on probability magnitude offers additional insight as it captures flexible interpretation of risk as probabilities that can range from more aversive (e.g., Prinsloo et al., 2022) to more attractive.

Self-Selected Decision Sequences

Beyond a summary subjective value, this work explores decision making as an unfolding process. In a situation where the decision-maker controls their navigation of information, it is also feasible for them to halt or withdraw from the decision mid-sequence. Experiment 6 explicitly allows this staged decision flow in the lottery task and finds that early consideration of risk also leads to a "diminished value" outcome by increasing rejection (withdrawal) decisions before seeing the full information. As such, it appears that the likelihood of winning can gate people's willingness to even evaluate the full prospect, let alone commit to paying for it.

We further show that the impact of viewing risk first on decision engagement is moderated by risk magnitude, with the volume of opt-outs significantly increasing for the risk-first preference people when the probability of winning was 10%, but (if anything) decreasing at 90%. Prior research supporting the risk-reward heuristic (e.g., Pleskac & Hertwig, 2014) has found that individuals generally infer an inverse relationship between risk and reward based on their experiences in the real world. This heuristic would predict that learning of a low probability of winning would cause a participant to infer a higher reward magnitude, perhaps making them *more* likely to continue. Instead, our finding is more consistent with being driven by an overall aversion to prospects with low probability gains (e.g., Prinsloo et al., 2022).

A complementary effect occurs with the reward information (Experiment S3, Supplemental Material C). The minority who chooses to view amount information first also disengages with the decision if that reward magnitude is very low. As such, the interaction of decision flow and attribute information is important across specific information preferences, providing a nuanced framework for understanding engagement with uncertain decisions. These effects are notable in part because revealing the second attribute is nearly costless in our task. Given this together with people's general curiosity and general motivation for knowledge (Gottlieb et al., 2020), it would be reasonable to expect people to complete the full information sequence. Instead, we propose that engagement with discretionary decisions requires diverging from the status quo and thus can be considered effortful (e.g., Payne, 1982). The result, as our evidence suggests, is that exposure to an insufficiently desirable attribute, such as a low probability of winning (e.g., Prinsloo et al., 2022) or a very low reward (e.g., Thaler, 1988), can cause them to decline the opportunity before its EV could even be calculated. In this process, people continuously judge whether the prospect is worth their engagement, allowing the information they select first to serve as a valid and sufficient rationale for withdrawal.

Limitations and Opportunities for Future Research

The present work demonstrates a novel aspect of how people seek information in discretionary uncertain choices. However, there are limitations that would benefit from further development, together with additional questions opened by these results. To begin with, although risk-first preferences were demonstrated across real and hypothetical decisions in Experiments 1A and 1B, the experiments that followed used only hypothetical stakes. Prior research has suggested that similar mechanisms, including overlapping neural circuitry, are involved across hypothetical and incentive-compatible choice (Camerer & Mobbs, 2017). Interestingly, the largest effect observed in this work occurred in the incentive-compatible Experiment 1A, in a manner supportive of the robustness of the primary information choice effect. However, the relative magnitudes could differ across the other task designs, as could the relative influence of the proposed ambiguity aversion mechanism shown in Experiments 3 and 4. Incentive-compatible studies might also offer additional clarity on the varying valuation effects observed for WTP. Particularly for extending this work to other consequential choice settings, it would be important to replicate the full range of experiments with real incentives.

As a second consideration, the present research explored which information people wanted to learn first when offered *desirable but uncertain* outcomes. This is consistent with and draws from prior work on sequential information effects on risky decisions (Lopes & Ekberg, 1980; Millroth et al., 2019). It also reflects a type of choice commonly found in everyday contexts (e.g., Experiment 5). However, it leaves an open question in the domain of loss. In our single lottery task, imposing loss stakes could create an unnatural or "weirdly" artificial setting, since it would be implausible for someone to pay for the possibility of losing money. A task that represented a plausible or externally valid decision in the domain of loss would be useful to extend our findings. It would further provide the complementary building block that would allow process-related predictions for the mixed gambles frequently studied in the prior literature, and provide insight on decisions where there may be both probabilistic pros and cons or a desirable target that is tempered by the possibility of drawbacks. As such, this offers a fruitful domain for expansion of the present insights.

Finally, our findings open a new question on how feedback on the eventual gamble might influence the expression of information-seeking preferences. In Experiment 5, participants generally chose likelihood information first across the hotel task, where they received feedback that the room was available, and also chose risk first in the subsequent lottery task. This offers some evidence that the risk-first preference could persist across more than one choice. However, the robustness of the repeat effect may also depend on the number of decisions being made and their similarity (or variety). Conversely, it may also be moderated by the variety-seeking or curiosity traits of the decision-maker. Perhaps of most interest, prior research suggests such repeated decisions will be influenced by the specific sequence of feedback experienced. Prior research on gambler's fallacy, "hot hand" effects, and asymmetric belief updating between gains and losses (e.g., Edwards, 1961; Thaler & Johnson, 1990; Tversky & Kahneman, 1971) suggests the order of wins and losses experienced could also moderate individual participant behavior dynamically in ways that would be important to examine. It may further be interesting to target the role of different learning mechanisms in the process. These considerations offer a valuable direction for additional study and would aid in integrating this work with other uncertainty research using multitrial tasks, including those using neural and physiological measures.

Constraints on Generality

Our experimental sample included English-speaking students from a university lab and two crowdsourcing platforms, Prolific and Mechanical Turk (via CloudResearch). We excluded participants who had previously taken part in a similar experiment, ensuring a degree of naivety to the task. Participants answered the surveys individually; we lack evidence that asking the same questions in a

group setting would yield the same result. Although the majority of the present experiments used images as stimuli (e.g., Figure 1) to elicit the order of information preference, we replicated risk-first preferences using other modalities in Experiment 5. Therefore, we do not expect variations in presentation to significantly affect the results. We have no reason to believe that the results depend on other characteristics of the participants, materials, or context.

Conclusions

Collectively, we demonstrate that when people can navigate their own way through an uncertain decision, they prefer to learn about risks before rewards. This preference is robust, but not uniform, and appears motivated by individual sensitivity to ambiguity. In addition, early attention to risk information can decrease the subjective value of an uncertain prospect when it is seen before reward. More broadly, when individuals have control over how the decision process unfolds, early exposure to a single attribute that suggests the prospect is not "worth" their effort can cause them to disengage before processing all the relevant information. As such, we show that order does indeed matter: Self-selected information sequences predict meaningful choice consequences throughout the decision process.

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