Experiential value neglect is robust to changes in learning architecture and nature of outcomes

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Abstract

In decision-making, values attached to options can stem from two sources: past experiences with rewards and punishments (experiential) or explicit descriptions of outcomes and probabilities (descriptive). According to the common currency hypothesis, we encode these subjective values on the same scale. Most studies examine decision-making within either experiential or descriptive options separately, but what about when individuals choose between the two? These hybrid choices reflect real-world decisions, such as choosing between a restaurant we've visited before (experiential) and one we know through online ratings (descriptive). Garcia et al. (2023) examined such hybrid choices by asking participants to choose between learned experiential options and symbolically described ones. Their findings revealed a systematic neglect of experiential options which persisted after controlling for alternative explanations such as insufficient learning and ambiguity aversion. This study explores whether experiential neglect arises from differences in how values are represented, or from memory retrieval cost. To investigate this, we ran three experiments, where we systematically manipulated the learning architectures and outcome information to reduce the representational difference between options. Our findings show that experiential neglect persisted across all conditions, further challenging the dominant theory and suggesting that the neglect is primarily driven by memory retrieval cost.

Keywords: Decision-making; Common Currency Hypothesis; Description-Experience Gap; Value Representation; Reinforcement Learning

Methods

This study builds on the methods of Garcia et al. (2023) by replicating their experiment three times with minor modifications. In each replication, participants (n=100 per study) choose between two types of options across multiple phases: experiential options (E-options) represented as eight abstract cues with probabilistic outcomes or symbolic options (S-options) presented as eleven pie charts explicitly depicting gain probabilities. For both options, gains (+1 point) and losses (-1 point) occur according to these probabilities, complete feedback is given. As seen in Figure 1A, the first phase, the Learning (LE) phase, presents participants with pairs of E-options. The value of each E-option is inferred from repeated exposure to gains and losses. Next, in the Experiential-Symbolic (ES) phase, participants choose between E-options learned in the LE phase and S-options, thus hybrid choices. A similar phase, the Experiential-Experiential (EE) phase, requires participants to choose between two previously learned E-options. The first replication (Exp 1) examines the role of the learning architecture, comparing the effect of training on all possible combinations (non-fixed pairs) of E-options in the LE phase instead of four fixed pairs as in the original study (Figure 1B). The second and third replication (Exp 2 and Exp 3) investigate the role of outcome representation by presenting outcomes of E-options in the LE phase as pie charts resembling S-options (lottery outcomes) instead of numeric outcomes (1/-1) as in the original study (Figure 1C). Exp 2 uses fixed pairs, whereas Exp 3 uses non-fixed pairs, in the LE phase. To compare the subjective value of E-options in the ES and EE phases, we first find the inferred subjective value of an E-option by fitting sigmoid functions to participants' choice rates and taking the indifference point. We then study the subjective valuations as a function of the objective underlying probability and compute its slope. A slope estimate closer to zero suggests participants don't consider E-options to make choices (experiential neglect), while a slope estimate closer to one indicates they choose with an unbiased true subjective representation. A smaller slope estimate in ES compared to EE would indicate that participants discount experiential values more in hybrid choices (ES) than in non-hybrid choices (EE).

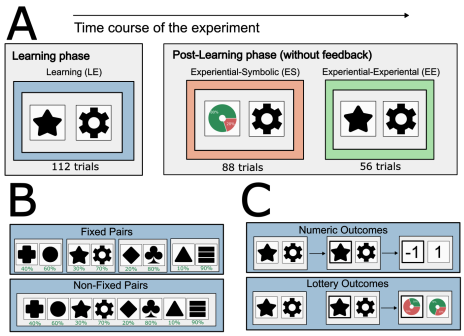

Figure 1: A. Structure of Experiment. B. Pairs presented in LE phase: Fixed (top) and Non-Fixed (bottom) conditions. C. Outcome presented in LE phase: Numeric (top) and Lottery (bottom) conditions.

Results

Learning Architecture

In the LE phase of Exp 1, we first see that participants correctly learn values of options as choice accuracy is above chance for nearly all trials (Figure 2A), both for the fixed and non-fixed pairs sessions. We find the probability of choosing an E-option as a function of the S-option for the ES phase or another E-option for the EE phase (Figure 2B) and compute the subjective E-options as function of their associated objective value for both phases (Figure 2C). Crucially, the ES slope is significantly lower than the EE slope as much in the fixed pair condition ($t(98) = -6.41$, $p < .001$, $d = -0.64$, 95% CI [-0.30, -0.16]) than in the non-fixed pair one ($t(98) = -7.54$, $p < .001$, $d = -0.76$, 95% CI [-0.32, -0.18]). This demonstrates that when participants make hybrid choices, they systematically undervalue experiential options, even when learning architecture shifts participants from policy-based representation to favor the learning of option-specific values.

Outcome representation

In the LE phase of Exp 2 and 3, we also see that participants correctly learn values of options as choice accuracy is

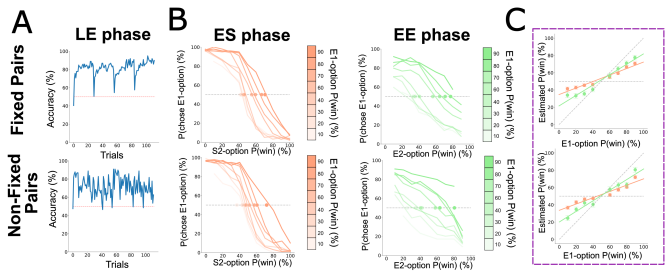

Figure 2: A. Choice accuracy in LE phase for fixed pairs (top) and non-fixed pairs (bottom). B. Probability of choosing a specific E-option over an S-option (ES phase, left column) or another E-option (EE phase, right column) for fixed pairs (top) and non-fixed pairs (bottom). Points correspond to indifference points, where the sigmoid function fitted to participants' choice rates crosses y = 0.5. C. Subjective valuation as function of objective underlying probability with regression lines for fixed pairs (top) and non-fixed pairs (bottom).

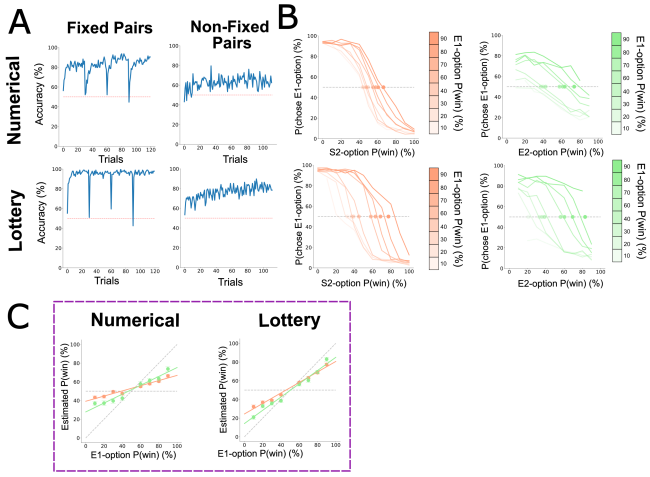

Figure 3: A. Choice accuracy in LE phase for numerical (top) and lottery outcomes (bottom). B. Probability of choosing a specific E-option over an S-option (ES phase, left column) or another E-option (EE phase, right column) for numerical (top) and lottery outcomes (bottom), pooled fixed and non-fixed pairs. Points correspond to indifference points, where the sigmoid function fitted to participants' choice rates crosses y = 0.5. C. Subjective valuation as function of objective underlying probability with regression lines numerical (top) and lottery outcomes (bottom), pooled fixed and non-fixed pairs.

above chance for nearly all trials (Figure 3A), both for fixed and non-fixed pairs sessions and for the numerical and lottery outcomes. Since we are interested in the effect of outcome representation regardless of the learning structure, we pool the data of the fixed and non-fixed sessions. We again find the probability of choosing an E-option as a function of the S-option for the ES phase or another E-option for the EE phase (Figure 3B) and we compute the subjective E-options as function of their associated objective value for both phases (Figure 3C). Once again, we find that the slope in the ES phase is significantly lower than the EE one as much for the numerical outcomes ($t(181) = -6.64$, $p < .001$, $d = -0.49$, 95% CI [-0.26, -0.14]) than for the lottery outcomes ($t(181) = -5.22$, $p < .001$, $d = -0.39$, 95% CI [-0.20, -0.09]). Furthermore, we computed a linear mixed model with random intercept at participant level and slope estimate as dependent variable. The independent variables were the nature of outcome (numerical vs lottery), the phase studied (ES vs EE) and the type of pairs used in LE (fixed vs no fixed). Our model revealed a significant main effect of phase (β=0.23, $p < .001$, SE=0.06, z=3.95), indicating a consistent slope difference between the ES and EE phases. However, there was no significant interaction effect between phase and outcome (β= 0.03, p=0.76, SE=0.08, z =0.31), nor between phase and pairs (β=0.06, p=0.47, SE=0.08, z=-0.73), meaning the phase difference is consistent regardless of outcome type or pair configuration. This indicates a consistent tendency to neglect experiential values in hybrid choices, even when outcomes in the learning phase are on the same representational scale as S-option values.

Discussion

This study further investigates systematic experiential neglect, as observed in Garcia et al.'s (2023) study, by testing whether it arises from differences in how experiential and descriptive values are represented. Contrary to symbolic options whose information is explicitly described, experiential option values are derived from the sequential integration of outcomes. Previous research suggests that experiential options are learned in a value-free manner (Bennett, Niv & Langdon, 2021, Hayden & Niv, 2021), making this policy-based learning hardly comparable to explicit value of symbols options. However, in Exp 1, we manipulated learning policies of experiential option value by allowing for option-specific learning (non-fixed pairs) rather than policy-based one (fixed pairs), which still resulted in experiential neglect. Beyond policy learning, one could argue that this neglect comes from the cost of translating value representations, as experiential options are encoded numerically while symbolic options are lottery-based. Nonetheless, in Exp 2 and 3, we presented experiential option's outcome information as lotteries (Sukoupova, Garcia & Palminteri, 2024) ensuring both types of options were represented on the same scale, and this experiential neglect persisted. Our findings provide additional evidence that experiential neglect is a robust and systematic phenomenon in hybrid choices. This further challenges the dominant theory in which option values are encoded in a common currency, suggesting instead that experiential and descriptive values are processed differently. Furthermore, since this experiential neglect isn't induced by value representation, this suggests that this neglect could stem from memory retrieval cost (Afrouzi et al, 2023, Dukas, 1999). Specifically, participants may discard experiential options as retrieving them from memory incurs a cognitive cost, as opposed to relying on immediately available information from symbolic options.

Acknowledgments

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