Information search strategies in within-domain vs. across-domain decisions

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Abstract

Extant theories of value-based decisions, in particular the common-currency hypothesis, assume that the brain computes subjective values for choice options and selects the preferred option on the basis of these value representations. Here, we challenge this view by arguing that the need to compute integrated option values depends on the type of decisions. Specifically, we contrast within-domain decisions, where options share common attributes, and across-domain decisions, where options have fundamentally different attributes. Because attribute-wise comparisons of different options are possible in within- but not across-domain decisions, we expect a higher need to compute option values in across-domain decisions. This should be reflected in different visual search patterns. To test this, we designed a value-based multi-attribute task with two types of within-domain and across-domain decisions. We recorded eye movements during the process of decision making and integrated value formation. Consistent with our hypothesis, participants exhibited more attribute-wise search patterns in within- compared to across-domain decisions, even though behavioral characteristics remained unchanged. Our results suggest that people use different decision strategies, that differ with respect to the need to compute integrated option values.

Keywords: Value-based decision-making; Subjective value representation; choice types; eye tracking

Introduction

Every day, we constantly make decisions between options that are characterized by multiple attributes. Some of these are within-domain decisions, such as picking between two vacation spots, where the options share similar attributes. Others are across-domain decisions, such as deciding whether to spend your birthday with friends or take a trip—here, the options are different in nature. Extant theories of value-based decisions, in particular the common currency hypothesis, assume that decisions are made by computing an integrated subjective value for each option from a weighted combination of attributes and choosing the option with the highest value (Levy & Glimcher, 2012). Here, we challenge this view by proposing that information search and decision processes depend on the type of choice: For within-domain choices, preferences can be formed by directly comparing different attributes, but for across-domain choices, the lack of comparable attributes enforces the separate computation of integrated values for each option. In this study, we aim to provide evidence for this distinction by showing that people use different strategies, which should be reflected in gaze pattern differences between these putatively different types of multi-attribute choices.

Methods

Participants. Twenty healthy participants (8 men and 12 women, age: range = 19 – 33, mean = 24.1, SD = ±0.89) completed a rating task followed by a choice task (Figure 1). Prior to the experiment, all participants were instructed in the experimental procedure and completed several practice trials.

Stimuli. We used real options available on the market at the time of data collection, 30 vacation plans (2 nights in a hotel on the north coast of Germany), and 30 tablets. Options were selected from a restricted price range. For each type of option, we selected three attributes: distance to the beach, room size, and number of stars for hotel options; and battery life, screen size, and memory storage for tablet options.

Rating task. An option with its three attributes was presented in the 3-second evaluation window. Then, during the 5-second rating window, participants were asked to report how much they like that option (Figure 1, upper panel). Participants completed a block of 60 rating trials. Ratings were used to create choice trials of varying levels of difficulty.

Choice task. Attributes of two options were presented on the screen during the 5-s evaluation window, and participants were asked to report their preferred option during the 3-second choice window. In the choice tasks, we included two types of blocks of within-domain and across-domain choices, in which the pair of options were from the same or different categories, respectively. Figure 1 (lower panel) shows an example of an across-domain trial. Participants completed eight blocks of 45 choice trials. We recorded gaze data with a stationary eye-tracking system.

Figure 1: Examples of a rating task trial and an across-domain choice trial.

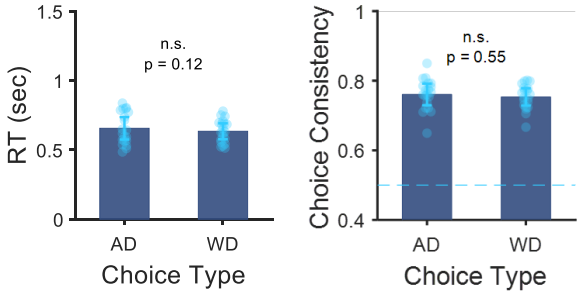

Figure 2: The left and right panels show that there is no difference between reaction time and choice consistency between across-domain (AD) and within-domain (WD) choices, respectively.

Results

Figure 2 shows that there were no behavioral differences in choice consistency (*t*-test: t(19) = 0.61, p = 0.55) and reaction time (*t*-test on log(RT): t(19) = 1.61, p = 0.12) between within-domain and choices. In contrast to this, the gaze pattern was systematically different between across-domain and within-domain choices (Figure 3). Specifically, we looked at the gaze pattern during the evaluation period of choice trials, finding that participants had significantly more attribute-wise transitions (transitions between the same attributes of different options) and significantly less option-wise transitions (transitions between the attributes of the same options) in within-domain as compared to across-domain choices. Consequently, the Payne Index (Payne, 1976), which contrasts the proportions of option-wise vs. attribute-wise transitions, was significantly higher in across-domain choices (*t*-test: t(19) = 15.66, p < 0.01) (Equation 1).

$$Payne\ Index = \frac{\#option_{wise} - \#attribute_{wise}}{\#option_{wise} + \#attribute_{wise}} \quad \text{Eq. 1}$$

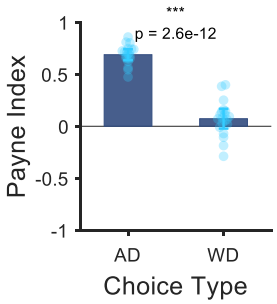

Figure 3: Different gaze patterns in different decision types. A higher Payne index in across-domain (AD) decisions indicates more option-oriented search and choice strategy than in within-domain (WD) decisions.

Conclusion

We observed markedly different gaze patterns in within-domain vs. across-domain choices, while the behavioral signatures were similar. According to our results, people use different information sampling strategies to make value-based decisions as a function of the comparability of options. Forming an integrated subjective value representation of each option might not be necessary in all types of decisions.

References

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