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Beyond similarity: Exploring cognitive bias and decision complexity in multi-alternative choice tasks

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ABSTRACT

This study investigates the conditions under which the similarity effect, where individuals prefer dissimilar choices when faced with similar alternatives, fails to manifest, and challenges established theories suggesting that individuals simplify decision-making by focusing on dissimilar options in complex situations. Using a series of experiments grounded in established theoretical frameworks, the study explores how decision complexity and cognitive load affect the manifestation of the similarity effect. Participants were tasked with making choices under conditions of uncertainty and cognitive strain to analyze shifts in decision-making strategies. The results reveal that in high-complexity situations, individuals do not prioritize dissimilar options as previously assumed; instead, they shift their focus to evaluating cognitive aspects of outcomes, such as trade-offs between advantageous and disadvantageous traits. As decision complexity increases, the importance of superficial similarity diminishes, and outcome assessment becomes more crucial. These findings have significant implications for our understanding of decision-making under uncertainty and offer new insights into the cognitive mechanisms involved, with potential applications in fields such as consumer behavior, policy-making, and risk management.

Contribution/Originality: This study challenges conventional assumptions about the similarity effect, demonstrating that individuals do not consistently prioritize dissimilar options in complex decision-making scenarios. Instead, under conditions of high uncertainty and cognitive load, decision-makers shift their focus from superficial similarities to deeper evaluations of outcome trade-offs and potential rewards. These findings reveal that the similarity effect is context-dependent, contradicting the notion of its universality and highlighting the adaptive nature of decision strategies in response to complexity. The study advances theoretical understanding by proposing a more dynamic, context-sensitive framework for how cognitive load and uncertainty reshape choice behavior.

1. INTRODUCTION

The exploration of decision-making amidst uncertainty represents a crucial domain of inquiry within cognitive psychology and behavioral economics. The similarity effect, a significant phenomenon in this field, manifests when

individuals, faced with a collection of similar choices, exhibit a marked preference for the dissimilar option (Tversky, 1972). This is also one of the most widely discussed context effects, the other prominent ones being the attraction and compromise effects.

However, Becker, Degroot, and Marschak (1963) provided the first evidence of this context effect. Scholars have extensively examined this phenomenon within the framework of multi-attribute choice tasks, observing that options with overlapping attributes tend to lose their appeal due to the challenges of differentiating between them. Consequently, decision-makers will select more distinct alternatives (Trueblood, 2012). Conventional views of the similarity effect as a cognitive bias stem from the mental effort required to distinguish between closely related choices.

However, remember that the dynamic interaction of available options can also cause the similarity effect (Roe, Busemeyer, & Townsend, 2001; Usher & McClelland, 2004).

Recent research indicates that the magnitude of the similarity effect can fluctuate based on contextual elements, including cognitive load and the complexity of decisions (Bettman, Luce, & Payne, 1998). In situations where individuals encounter intricate decision-making tasks or experience cognitive pressure, the approaches they employ to arrive at decisions may change.

In these instances, individuals may shift their attention from the similarities among options to emphasize various cognitive aspects, such as possible outcomes or the extremes of the choices presented (Payne, Bettman, & Johnson, 1993). Spektor, Gluth, Fontanesi, and Rieskamp (2019) go one step ahead and argue that the attentional bias can be directed towards the salience of the outcomes. Also, the stochastic nature of the attentional bias has also been noted (Noguchi & Stewart, 2018; Trueblood, Liu, Murrow, Hayes, & Holmes, 2022). This change in approach indicates that the similarity effect might not consistently apply, especially as the cognitive demands of the decision-making task escalate.

Researchers of descriptive models of decision-making suggest that the changes in choices can be dramatic when the attributes are explicitly known (Bhatia, 2013; Tsetsos, Usher, & Chater, 2010). Similarly, the researchers express confidence in the internal representation of options, which they base on the variability of their outcomes as attributes. What they fail to understand is the complex interplay of these attributes (Mikhael & Bogacz, 2016; Spektor et al., 2019; Sutton & Barto, 1998). Further, in so far as attention is defined as a process determining comparisons of alternatives to be made by the decision maker, and where the alternatives are commensurable, the direction of the attention may move to the inter-attribute comparisons (Evangelidis & van Osselaer, 2019; Trueblood et al., 2022).

Trueblood (2012) illustrated that, across various decision-making contexts, individuals generally prefer dissimilar options rather than similar ones, reinforcing the established concept of the similarity effect. Nonetheless, this finding fails to consider scenarios in which the choices are intricate and decision-makers experience cognitive load. In these situations, decision-makers might not depend exclusively on the similarities or differences among the available options.

Rather, decision-makers may focus on the cognitive aspects of the results, especially when extreme selections link both advantageous and disadvantageous values, unlike more moderate or comparable alternatives. For instance, when confronted with decisions that involve uncertain or ambiguous outcomes, individuals may evaluate the trade-offs linked to extreme choices with greater scrutiny, consequently reducing the influence of similarity in their decision-making process (Kahneman & Tversky, 1979).

This study explores the circumstances in which the similarity effect fails to manifest, particularly emphasizing the impact of cognitive load and decision complexity on decision-making strategies. The researchers suggest that as complexity escalates, individuals move away from assessing options based on similarity and instead adopt a strategy that emphasizes evaluating cognitive dimensions, including potential outcomes or extreme options. Bettman et al. (1998) grounded this theoretical perspective by proposing that individuals often simplify their decision-making

processes when faced with high cognitive load. However, the researchers propose that such simplification does not inherently result in a preference for dissimilar options. The cognitive aspects of outcomes, especially when they entail trade-offs between positive and negative values, are of greater importance than the mere superficial traits of choice similarity.

This research aims to question prevailing theoretical frameworks regarding the similarity effect by incorporating the influence of cognitive complexity and outcome uncertainty on decision-making strategies. The researchers seek to improve understanding of how decision-makers operate within complex settings, broadening existing frameworks of choice behavior beyond their traditional emphasis on similarity and dissimilarity. Building on previous research, this study addresses two primary questions: Under what conditions does the similarity effect fail to emerge? and how do cognitive load and decision complexity alter decision-making strategies in multi-alternative choice tasks? Specifically, this research examines whether individuals, when faced with intricate decisions and uncertain outcomes, rely less on superficial similarities and more on the cognitive evaluation of trade-offs between potential outcomes.

The significance of this research lies in its potential to redefine how we understand decision-making processes in real-world, complex scenarios. By exploring the boundaries of the similarity effect, this study not only extends theoretical models but also provides practical implications for fields such as consumer behavior, policy-making, and risk management, where decision-makers frequently encounter high levels of complexity and uncertainty.

2. LITERATURE REVIEW

The similarity effect, initially identified by Tversky (1972), is considered a significant cognitive bias that influences decision-making under uncertainty. The theory proposes that when individuals face several similar options, the difficulty in distinguishing among them increases the likelihood of favoring the notably different alternative.

This model, based on the theory of elimination-by-aspects, suggests that decision-makers simplify their choice process by progressively discarding options based on the attributes they deem least desirable. As a result, diverse alternatives often appear more attractive, even if they are not necessarily the most logical choice.

Expanding upon this foundation, scholarly inquiry has deepened our understanding of how decision-makers assess and interpret comparable and contrasting alternatives. Roe et al. (2001) offered a comprehensive framework that elucidated context-dependent preferences through the lens of decision field theory (DFT). DFT posits that decision-makers gather evidence for or against each option as time progresses. This accumulation process slows down when faced with highly similar options, making dissimilar alternatives more appealing. This framework has significantly contributed to our understanding of dynamic decision processes; however, it does not comprehensively consider how cognitive load or decision complexity might influence these outcomes.

Trueblood (2012) conducted new research that expanded the study of the similarity effect to tasks involving more than one attribute. It demonstrated that people still strongly prefer options that differ from each other when different attributes compete for attention. Trueblood's research highlighted that perceptual resemblance among choices often leads to a compensatory decision-making approach, where individuals tend to avoid the cognitive effort required to differentiate between similar alternatives. Her findings have provided essential insights into context effects in decision-making, especially within multi-alternative environments. However, as noted by Ariely, Loewenstein, and Prelec (2006), decision-makers inherently incorporate an evaluative aspect into their choices one that involves trade-offs between the outcomes of various options rather than focusing solely on perceptual characteristics.

The differentiation between perceptual similarity and cognitive evaluation adds a nuanced dimension that the conventional similarity effect fails to adequately account for. Research indicates that as cognitive load or decision complexity rises, individuals tend to depend more heavily on heuristic strategies (Bettman et al., 1998). Bettman et

al. (1998) posited that when individuals face cognitive strain, they frequently turn to simplifying heuristics that enable more efficient processing of choices. The heuristics in question may involve concentrating on a specific subset of options or attributes; however, they do not inherently lead to the dissimilarity preference anticipated by the similarity effect.

Researchers such as Payne et al. (1993) have examined the relationship between cognitive load and decision complexity in greater detail. They found that individuals experiencing significant cognitive strain tend to make simpler decisions based on a smaller number of more important factors. The adaptive decision-maker framework suggests that individuals modify their strategies according to the complexity of the task they face. Simon (1955)'s notion of bounded rationality aligns with this perspective, proposing that individuals operate within cognitive limitations, which leads them to make "satisficing" choices rather than optimal ones. In complex or ambiguous situations, individuals may shift their decision-making process from merely comparing the similarity of options to focusing more on the cognitive aspects of the outcomes themselves.

Furthermore, Kahneman and Tversky (1979) prospect theory underscores the importance of individuals' assessment of potential outcomes, particularly in uncertain situations. Their research revealed that people tend to avoid risks when it comes to gains, while actively seeking risks in the face of losses. This tendency to prefer certain outcomes over others, irrespective of their similarities, indicates that the evaluation of outcomes is a critical factor in the decision-making process. Similarly, Chater, Tenenbaum, and Yuille (2006) examined the influence of cognitive representations of options on decision-making. They posited that making decisions in complex situations requires more sophisticated assessments of risks, rewards, and trade-offs, extending beyond simple perceptual similarity.

These developments underscore the inadequate examination of the relationship between decision complexity and the similarity effect. Evidence indicates that when faced with ambiguous or extreme outcomes, individuals tend to prioritize the relative advantages or disadvantages of potential results over the similarity of options (Hsee & Zhang, 2004).

This holds particularly true when individuals face high-stakes decisions, wherein both the advantageous and disadvantageous aspects of extreme options are meticulously considered, resulting in departures from the anticipated similarity effect.

3. METHODS

3.1. Research Design

This study employs an experimental research design aimed at exploring the conditions under which the similarity effect in decision-making fails to manifest, especially under varying levels of cognitive load and decision complexity.

By utilizing a modified choice experiment, the study tests hypotheses related to how participants' choices are influenced by the presence of similar versus dissimilar options within distinct sets of items. The experimental design incorporates two primary choice sets with unique items, ensuring no repetition across sets to better isolate the similarity effect and minimize confounding variables. The study adopts a within-subject design where participants interact with two choice sets, making multiple selections from each. This design allows for the collection of detailed data on how decision-making behavior evolves as participants are exposed to similar or dissimilar options under cognitive strain introduced through time constraints.

3.2. Research Population

The study population consists of 35 graduate students from Sri Ramakrishna College of Arts & Science (Autonomous Institute) in Coimbatore, Tamil Nadu. This sample was selected due to the participants' academic familiarity with decision-making processes, making them ideal candidates for understanding the cognitive

mechanisms underlying the similarity effect. The participants, while representative of a young, educated cohort, were chosen to reflect real-world decision-makers who frequently encounter complex choices in daily life.

3.3. Instrument

The primary data collection instrument was a web-based game interface, specifically designed for this experiment and made publicly available on GitHub (https://theadvaitist.github.io/TreasureHuntGame/). The game simulates real-world decision-making through a treasure hunt where participants select from six chests (A1, A2, A3, B1, B2, B3), each containing different reward structures. The instrument allows participants to interact with the game across multiple rounds, introducing time pressure to simulate cognitive load and uncertainty. The game's design aims to measure how similarity or dissimilarity among options influences the choices made by participants.

Data was collected on the number of times each item was chosen, the value of rewards associated with each selection, and the time taken to make decisions. This detailed data allowed for an in-depth analysis of the participants' decision-making strategies under varying levels of complexity.

3.4. Validity and Reliability Tests

To ensure the validity of the instrument, the game design was pretested with a small group of participants, ensuring that it accurately reflects real-world decision-making scenarios. The reward structure of the chests was carefully constructed to provide a range of both low- and high-risk options, with corresponding rewards that reflect the complexity of real-life choices. Additionally, the introduction of time constraints was validated to simulate cognitive load effectively, aligning with similar experimental designs in decision-making research.

The reliability of data collection was tested using internal consistency measures. Multiple rounds of the experiment were conducted to ensure that participants' choices were consistent over time and not influenced by external variables.

3.5. The Study's Hypotheses

H_1: The likelihood of selecting alternatives decreases as the uncertainty associated with potential rewards increases.

H_2: Participants are more likely to exhibit consistent decision-making behavior when rewards and uncertainties are relatively moderate, compared to scenarios with extreme uncertainty.

H_3: The inclusion or exclusion of other alternatives in the choice set does not significantly affect the relative odds of selecting one over another, validating the IIA assumption.

H_4: Higher levels of cognitive load or complexity in the choice sets lead to a disproportionate preference for alternatives with lower uncertainty. Experimental Design.

3.6. Mean and Standard Deviation of Choices and Choice Sets

Given the reward sets of each chest, the mean and standard deviation for each can be calculated to better understand the distribution of rewards across the chests.

Table 1. An overview of the expected reward values and their variability for each chest.

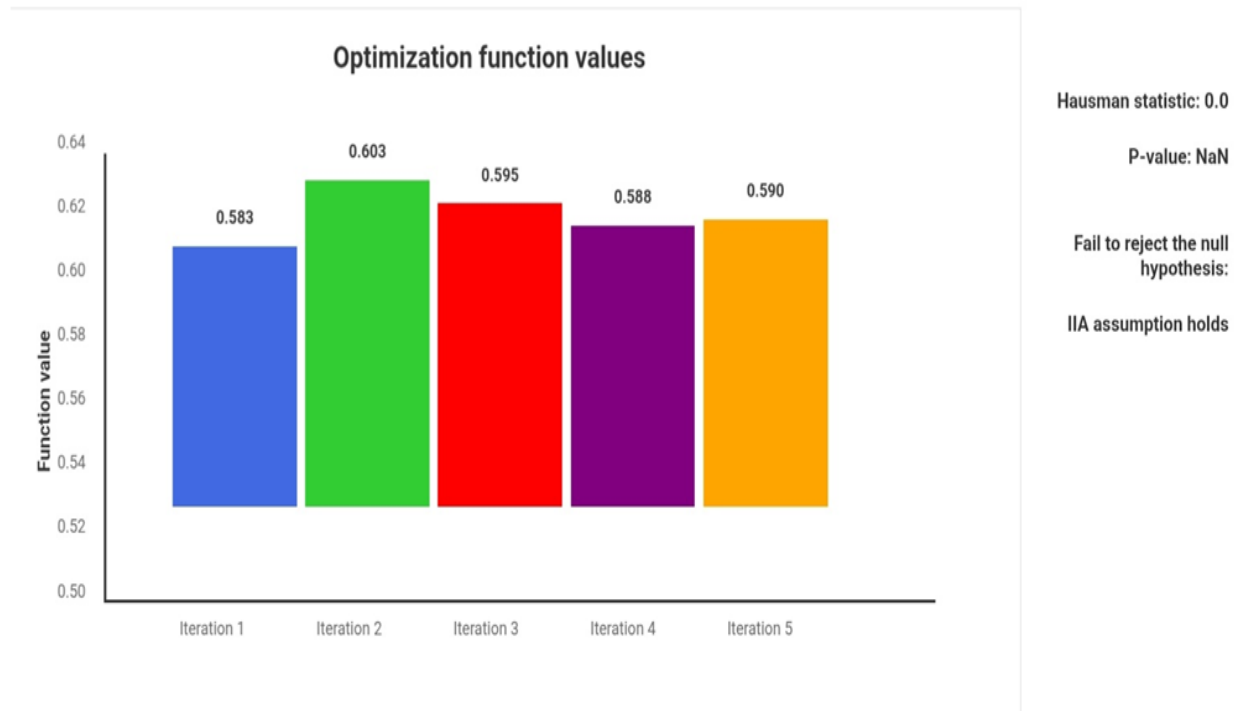| Chest	Mean (Grams)	Standard Deviation (Grams)
A1	9.00	4.58
A2	13.50	6.91
A3	17.60	22.66
B1	18.00	10.58
B2	22.50	12.94
B3	25.08	35.13

Figure 1. Optimization results of the Hausman statistic.

4. RESULTS

Figure 1 illustrates the function values across five iterations of the optimization process. The values shown (e.g., 0.582671, 0.603126) indicate how close the model is to reaching an optimal solution during different iterations. The differences in values between iterations demonstrate the model's improvement. The subplot displays the Hausman test result, indicating that the present study failed to reject the null hypothesis, which means that the IIA assumption holds. Table 1 presents expected reward values and their variability across each chest.

Table 2. The summary of mixed linear model regression analysis for reward.

Statistic	Value
Model	MixedLM
Dependent variable	Reward
No. observations	420
Method	REML
No. groups	35
Scale	328.0585
Min. group size	12
Log-likelihood	–1804.4263
Max. group size	12
Converged	Yes
Mean group size	12

Table 3. Coefficients and significance levels for chest options in the mixed linear model.

Chest option	Coefficient	p-value	Interpretation
Intercept	9.128	< 0.001	Statistically significant
Chest [T.A2]	3.729	0.232	Not statistically significant
Chest [T.A3]	3.728	0.255	Not statistically significant
Chest [T.B1]	9.038	0.004	Statistically significant, strongly positive impact
Chest [T.B2]	14.596	< 0.001	Highly significant, very strong positive effect
Chest [T.B3]	12.153	< 0.001	Highly significant, strong positive influence

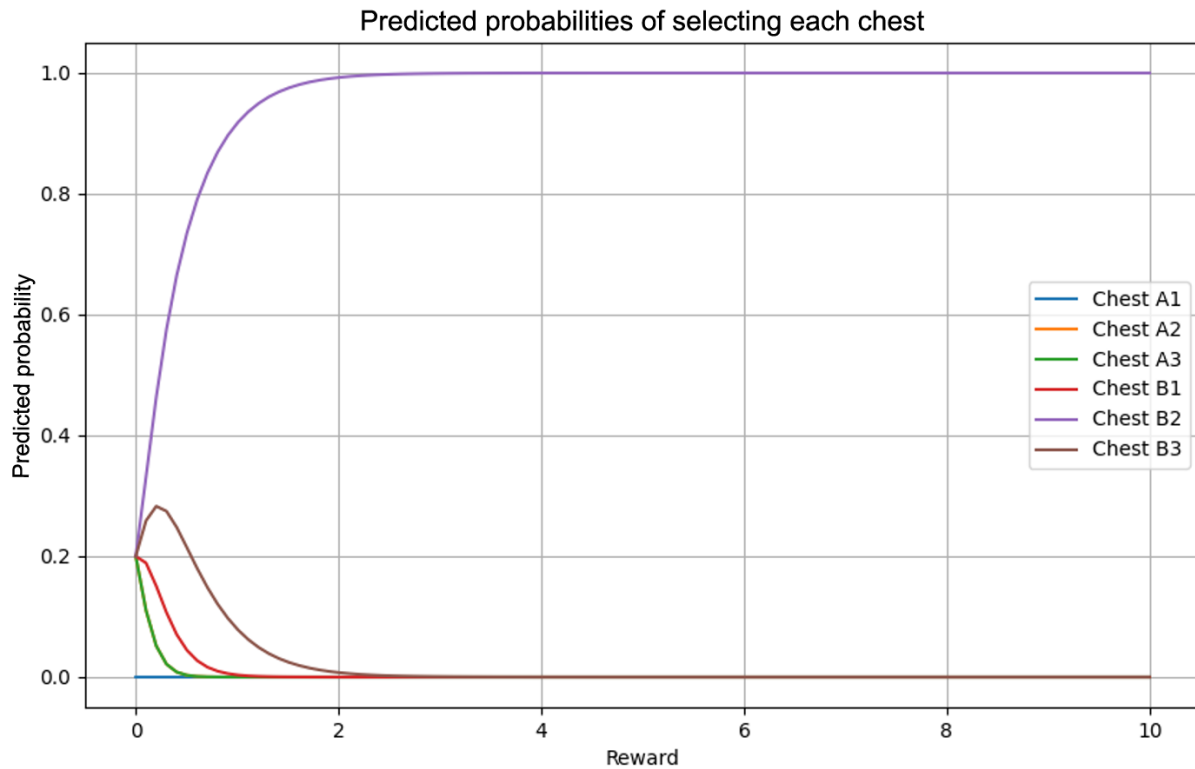## Predicted probabilities of selecting each chest

Figure 2. Predicted probabilities of selecting each chest based on the mixed linear regression analysis.

In Figure 2, Chest B2 (purple line) appears to dominate the probability of selection when the reward is higher. As the reward increases, the probability of selecting Chest B2 approaches 1, indicating it becomes the clear favorite. The other chests (A1, A2, A3, B1, B3) start with small probabilities, but they quickly drop as the reward increases. This suggests that when rewards are low, these chests are considered viable options, but as the advantages increase, they are less likely to be chosen. The sharp initial increase in probability for Chest B2 indicates that even small increases in reward make it highly preferable compared to the other chests. Table 2 presents the mixed linear model regression analysis. Table 3 presents coefficients and significance levels for chest options in the mixed linear model.

The IIA assumption states that the relative odds of choosing one option over another should remain constant, regardless of the presence or absence of other alternatives. This implies that adding or removing a chest should not disproportionately affect the probability of selecting any of the remaining chests. Figure 2 reinforces the IIA assumption as valid when it illustrates that as rewards increase, the probabilities of selecting certain chests change, but the changes in probabilities are smooth and proportional across different options. For instance, while Chest B2 clearly becomes more dominant as rewards increase, the probabilities of the other chests decline gradually, without any abrupt or disproportionate shifts. This result is consistent with the understanding that if a similar option becomes the dominant option, there will be an increase in the option's share (Huber, Payne, & Puto, 1982; Pettibone & Wedell, 2000). This suggests that the probabilities across all chests are appropriately balanced and follow a predictable, logical trend based on reward levels. The IIA assumption, which maintains stable relative odds between choices even after considering other alternatives, aligns with this behavior. The outcome also demonstrates compromise effects, favoring moderate options over extreme ones (Simonson, 1989).

4.1. Hypothesis Testing

H_1: The likelihood of selecting alternatives decreases as the uncertainty associated with potential rewards increases.

The graph illustrating predicted probabilities reveals that alternatives characterized by greater uncertainty generally exhibit a diminished likelihood of selection. The pronounced declines observed for chests with lower initial reward probabilities, such as Chest A3 or B1, serve as evidence of this. Although participants may initially

gravitate towards higher rewards, their inclination to choose these options decreases as uncertainty increases, especially when they confront lower-probability alternatives. This finding supports H1 and confirms that uncertainty reduces the appeal of the alternatives.

H₂: Participants are more likely to exhibit consistent decision-making behavior when rewards and uncertainties are relatively moderate, compared to scenarios with extreme uncertainty.

The smooth, nearly linear curves observed in specific chests (for instance, Chest B2) indicate that participants exhibit greater consistency in their decision-making when faced with high rewards and relatively moderate uncertainties. Conversely, the more variable or pronounced curves for options characterized by significant uncertainty (e.g., Chest A1) indicate a less predictable pattern of choice behavior. This suggests that a moderate level of uncertainty fosters more stable and consistent decision-making patterns, thereby reinforcing H2.

H₃: The inclusion or exclusion of other alternatives in the choice set does not significantly affect the relative odds of selecting one over another, validating the IIA assumption.

The results of the Hausman test revealed a Hausman statistic of 0.0 and a non-significant p-value (NaN), indicating that the study does not reject the null hypothesis. This suggests that the IIA assumption is satisfied, and the relative likelihood of choosing one chest over another remains unaffected by the presence or absence of other chests. As a result, the findings support H3, affirming the IIA assumption and endorsing the use of multinomial logit modeling for the research.

H₄: Higher levels of cognitive load or complexity in the choice sets lead to a disproportionate preference for alternatives with lower uncertainty.

Although the study does not directly assess cognitive load, the observed patterns in the predicted probabilities indicate that participants may prefer options with reduced uncertainty as the complexity of the choice set increases. For instance, Chest B2, which provides the greatest reward with reduced associated uncertainty, prevails in the selection process across various levels of reward. This behavior aligns with H4 because people tend to choose options with less uncertainty when situations become more complex. This demonstrates that people strongly prefer safer, more predictable outcomes.

Trueblood (2012) research investigated the emergence of the similarity effect, which describes the tendency of individuals to favor dissimilar options over similar ones, particularly in intricate decision-making contexts. Trueblood posits that when individuals encounter various alternatives, particularly under cognitive strain, they tend to streamline their decision-making process, frequently resulting in a preference for distinct options.

The present research aligns with Trueblood (2012)'s assertion that complexity impacts decision-making behavior. There are clear and changing probability curves for certain chests (most notably chests A1 and A3). This suggests that participants make erratic decisions when there is a lot of uncertainty. This reflects Trueblood's perspective that cognitive load and complexity may lead to less predictable decision-making behavior.

The results of the study present a departure from the findings of Trueblood (2012) regarding the similarity effect. In the current examination, participants did not exhibit a marked preference for dissimilar options. Rather, they were inclined to move toward the option that appeared to offer them more reward (e.g., Chest B2), irrespective of its resemblance or lack thereof to other alternatives. This indicates that in scenarios where rewards are at stake, especially when outcomes are uncertain yet potentially significant, individuals tend to emphasize the expected value of outcomes rather than the cognitive simplification outlined.

This study's Hausman test upheld the IIA assumption, indicating that participants' preferences for one chest over another remained consistent, regardless of the inclusion or exclusion of additional chests (Luce, 1959). This contrasts with the Tversky (1972) EBA model, which suggests that violations of IIA may occur when incorporating alternatives with overlapping characteristics. This study demonstrated that participants consistently prioritized the rewards presented by the chests, with their relative preferences remaining stable, thereby supporting the applicability of the MN Logit model.

Although Tversky (1972) model anticipates that the addition of extra chests (for instance, those offering lower or higher rewards) would influence choice probabilities, the results presented indicate that participants mainly focus on the potential reward rather than dismissing options due to insignificant factors. This emphasis on reward dominance in decision-making diverges from Tversky's theory, particularly in situations where the stakes (rewards) are evident and prominent.

4.2. Uncertainty and Decision-Making

The study's findings align with Trueblood (2012) and Tversky (1972), providing overarching insights into uncertainty, while also adding additional dimensions to understanding how individuals navigate decision-making in scenarios characterized by reward uncertainty. The results of this study support this perspective—participants exhibited a clear preference for Chest B2, which offered higher rewards with less uncertainty. This tendency aligns with extensive research in behavioral economics, indicating that individuals often prefer to avoid risk when faced with uncertainty.

Although Trueblood (2012) and Tversky (1972) highlighted cognitive mechanisms such as simplification and elimination, the findings of this study indicate that the reward framework assumes a more significant influence in the context of uncertainty. Participants may continue to streamline their decision-making processes; however, they achieve this by concentrating on reward outcomes instead of depending on the heuristics previously examined by Trueblood (2012) and Tversky (1972).

This study's findings demonstrate that the similarity effect is not present within the parameters of this investigation. Participants did not demonstrate an unequal inclination towards options that were distinct from others within the selection set. The anticipated reward emerged as the primary factor influencing choice probabilities, even in the presence of uncertainty or complexity. In contrast to Tversky (1972)'s prediction that participants would discard alternatives due to overlapping features, the findings revealed that people maintained stable preferences, predominantly shaped by the reward level, throughout all choice sets. The observed stability reinforces the IIA assumption and validates the appropriateness of the multinomial logit model.

5. DISCUSSION

J. S. Trueblood (2012) demonstrated that individuals tend to favor dissimilar options over similar ones, which reinforces the traditional concept of the similarity effect. In contrast, the present study found that this tendency may not always hold true under conditions of uncertainty and cognitive load. Specifically, the present study observed that participants, when faced with more complex or uncertain outcomes, did not rely solely on the similarity or dissimilarity of the available options. Instead, they focused more on the potential rewards and trade-offs presented by the choices. This finding diverges from Trueblood (2012), suggesting that the similarity effect diminishes as decision complexity increases and cognitive resources are stretched. This nuanced perspective aligns with Kahneman and Tversky (1979) assertion that decision-makers scrutinize extreme choices more carefully when faced with ambiguous or uncertain outcomes, indicating that decision-making under uncertainty follows a different pattern than when choices are simpler or more clear-cut.

Bettman et al. (1998) proposed that individuals tend to simplify their decision-making strategies when cognitive load is high. While the present study supports the notion that cognitive load influences decision-making, the study diverges from their findings by suggesting that simplification does not necessarily occur. Instead, participants in the present study demonstrated a focus on evaluating the cognitive dimensions of the outcomes, particularly when trade-offs between positive and negative outcomes were involved. Rather than reducing their decision-making processes to a simplified form, participants weighed the potential outcomes more deliberately, especially when choosing between extreme options. This indicates that when faced with high complexity and

uncertainty, decision-makers may not resort to simplification but instead adopt a strategy that emphasizes a more thorough evaluation of risks and rewards.

Kahneman and Tversky (1979) Prospect Theory has long underscored the idea that individuals evaluate risks and uncertainties in a non-linear fashion, often overvaluing potential losses relative to gains. The present research supports this framework by showing that, under conditions of uncertainty, participants exhibited a more cautious approach when presented with extreme options (e.g., items A3 or B3). Rather than following the traditional pattern of maximizing expected utility, participants in the study scrutinized the outcomes, demonstrating a clear sensitivity to uncertainty in a manner consistent with Prospect Theory. Moreover, this sensitivity became more pronounced as the uncertainty in the reward structure increased, reinforcing Kahneman and Tversky (1979) findings. However, the study results also suggest that participants remained focused on reward maximization rather than opting for simplified choices, indicating a more complex interplay between cognitive load, uncertainty, and reward evaluation.

6. CONCLUSION

This research contributes to the ongoing discussion regarding the impact of uncertainty on decision-making processes. It is noteworthy that Trueblood (2012) and Tversky (1972) studied cognitive heuristics. However, the study results indicate that when outcomes are uncertain and multiple rewards are possible, the desire to maximize rewards has a greater influence than cognitive simplification or excluding options based on specific factors. Participants appear to prioritize potential rewards over using similarity heuristics to simplify decisions or omit options with common features. This finding suggests a need to reevaluate the relationship between risk and reward in decision-making, especially under conditions of uncertainty. The current research offers valuable insights into decision-making in uncertain environments by synthesizing and examining the contributions of Trueblood (2012) and Tversky (1972). The findings confirm the importance of uncertainty and complexity in shaping choice behavior and emphasize the dominant role of reward expectations. This emphasis on rewards differs from traditional perspectives on decision-making, indicating that individuals tend to focus on potential benefits rather than relying solely on simple rules or disregarding similar options. These results pave the way for further research into the interaction between reward structures, uncertainty, and cognitive processes in multi-alternative decision environments, particularly in high-stakes situations.

7. POLICY SUGGESTIONS AND IMPLICATIONS

The findings of this study have significant implications for policy formulation, particularly in the context of promoting sustainable decision-making and aligning with Sustainable Development Goal (SDG) 12, which focuses on responsible consumption and production. In decision-making scenarios marked by uncertainty and complex trade-offs, individuals tend to prioritize maximizing outcomes over simplifying their choices or disregarding similar options. This insight can inform policies that encourage sustainable consumption by leveraging the cognitive mechanisms that drive decision-making.

1. Promoting sustainable decision-making through highlighted rewards

The results suggest that consumers are more likely to engage with sustainable choices when they recognize the concrete rewards associated with them, even in the presence of uncertainty. Policymakers and businesses should focus on emphasizing the long-term benefits of sustainable consumption, such as:

- Economic Savings: Promote products that, while initially more expensive, provide long-term cost savings (e.g., energy-efficient appliances or sustainable packaging).
- Health and Well-being: Highlight the personal health benefits of choosing eco-friendly or socially responsible products, such as organic foods or fair-trade goods.
- Environmental Impact: Emphasize the broader environmental benefits of responsible consumption, such as reducing carbon footprints or supporting biodiversity.

By clearly communicating these rewards, policymakers can help shift consumer behavior toward sustainable choices, even when the immediate decision feels complex or uncertain.

2. Interventions Focused on Cognitive Engagement Rather than Simplification

The study finds that when faced with complex choices, individuals are not necessarily inclined to simplify their decisions. This challenges the assumption that simplifying information is always the most effective strategy for encouraging responsible consumption. Instead, policies and interventions should aim to engage consumers' cognitive processing by providing detailed, transparent information about the trade-offs involved in sustainable choices. For example:

- Product Labeling: Use clear and comprehensive product labels that outline the environmental and social trade-offs, helping consumers make informed decisions.

- Interactive tools: Develop digital tools or apps that allow consumers to assess the long-term benefits of their purchases, such as carbon calculators or life cycle analysis tools.

- Education Campaigns: Create awareness programs that educate consumers about the complexities and rewards of sustainable consumption, reinforcing the value of making informed decisions.

REFERENCES

Ariely, D., Loewenstein, G., & Prelec, D. (2006). Tom Sawyer and the construction of value. *Journal of Economic Behavior & Organization*, *60*(1), 1-10. https://doi.org/10.1016/j.jebo.2004.10.003

Becker, G. M., Degroot, M. H., & Marschak, J. (1963). Probabilities of choices among very similar objects: An experiment to decide between two models. *Behavioral Science*, *8*(4), 306-311. https://doi.org/10.1002/bs.3830080403

Bettman, J. R., Luce, M. F., & Payne, J. W. (1998). Constructive consumer choice processes. *Journal of Consumer Research*, *25*(3), 187-217. https://doi.org/10.1086/209535

Bhatia, S. (2013). Associations and the accumulation of preference. *Psychological Review*, *120*(3), 522-543. https://doi.org/10.1037/a0032457

Chater, N., Tenenbaum, J. B., & Yuille, A. (2006). Probabilistic models of cognition: Conceptual foundations. *Trends in Cognitive Sciences*, *10*(7), 287-291. https://doi.org/10.1016/j.tics.2006.05.007

Evangelidis, I., & van Osselaer, S. M. (2019). Interattribute evaluation theory. *Journal of Experimental Psychology: General*, *148*(10), 1733-1749.

Hsee, C. K., & Zhang, J. (2004). Distinction bias: Misprediction and mischoice due to joint evaluation. *Journal of Personality and Social Psychology*, *86*(5), 680-695. https://doi.org/10.1037/0022-3514.86.5.680

Huber, J., Payne, J. W., & Puto, C. (1982). Adding asymmetrically dominated alternatives: Violations of regularity and the similarity hypothesis. *Journal of Consumer Research*, *9*(1), 90-98. https://doi.org/10.1086/208899

Kahneman, D., & Tversky, A. (1979). Prospect theory: An analysis of decision under risk. *Econometrica*, *47*(2), 263–291. https://doi.org/10.2307/1914185

Luce, R. D. (1959). *Individual choice behavior: A theoretical analysis* New York: Wiley.

Mikhael, J. G., & Bogacz, R. (2016). Learning reward uncertainty in the basal ganglia. *PLoS Computational Biology*, *12*(9), e1005062. https://doi.org/10.1371/journal.pcbi.1005062

Noguchi, T., & Stewart, N. (2018). Multialternative decision by sampling: A model of decision making constrained by process data. *Psychological Review*, *125*(4), 512-544.

Payne, J. W., Bettman, J. R., & Johnson, E. J. (1993). *The adaptive decision maker*. Cambridge, England: Cambridge University Press.

Pettibone, J. C., & Wedell, D. H. (2000). Examining models of nondominated decoy effects across judgment and choice. *Organizational Behavior and Human Decision Processes*, *81*(2), 300-328. https://doi.org/10.1006/obhd.1999.2880

Roe, R. M., Busemeyer, J. R., & Townsend, J. T. (2001). Multialternative decision field theory: A dynamic connectionst model of decision making. *Psychological Review*, *108*(2), 370-392. https://doi.org/10.1037/0033-295X.108.2.370

Simon, H. A. (1955). A behavioral model of rational choice. *The Quarterly Journal of Economics*, *69*(1), 99-118. https://doi.org/10.2307/1884852

Simonson, I. (1989). Choice based on reasons: The case of attraction and compromise effects. *Journal of Consumer Research*, *16*(2), 158-174. https://doi.org/10.1086/209205

Spektor, M. S., Gluth, S., Fontanesi, L., & Rieskamp, J. (2019). How similarity between choice options affects decisions from experience: The accentuation-of-differences model. *Psychological Review*, *126*(1), 52-88. https://doi.org/10.1037/rev0000122

Sutton, R. S., & Barto, A. G. (1998). *Reinforcement learning: An introduction*. Cambridge, MA: MIT Press.

Trueblood, J., Liu, Y., Murrow, M., Hayes, W., & Holmes, W. (2022). Attentional dynamics explain the elusive nature of context effects. *Proceedings of the National Academy of Sciences*, *119*(2), e2113003119.

Trueblood, J. S. (2012). Multialternative context effects obtained using an inference task. *Psychonomic Bulletin & Review*, *19*, 962-968. https://doi.org/10.3758/s13423-012-0288-9

Tsetsos, K., Usher, M., & Chater, N. (2010). Preference reversal in multiattribute choice. *Psychological Review*, *117*(4), 1275-1291.

Tversky, A. (1972). Elimination by aspects: A theory of choice. *Psychological Review*, *79*(4), 281-299. https://doi.org/10.1037/h0032955

Usher, M., & McClelland, J. L. (2004). Loss aversion and inhibition in the similarity effect. *Journal of Experimental Psychology: Human Perception and Performance*, *30*(2), 319–332.