When Decoys Are Easy to Reject: Comparative Asymmetry and Context Effects in Consumer Product-Pack Choice

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Abstract

Adding an inferior option can increase preference for the option that dominates it, but attraction effects are often fragile across small changes in stimulus construction and task demands. The present experiment asks which comparison within a consumer choice set gives a decoy leverage. Participants chose among consumer product packs described by quantity and price. The stimulus construction used ratio-comparison principles to hold Target–Competitor comparability approximately constant while manipulating whether the Target–Decoy comparison was easier than the Competitor–Decoy comparison. The relative share of the target was elevated when this decoy-related comparative asymmetry was high, but returned to chance when the asymmetry was low. Trial-level response-time analyses further suggested that deliberation primarily predicted rejection of the decoy, whereas the Target–Competitor balance was approximately RT-invariant after decoy choices were excluded. These results support a process-level account in which attraction depends on the comparative structure that makes the decoy easier to reject relative to the target than relative to the competitor, rather than on gradual target preference build-up alone.

Keywords: attraction effect; decoy effect; consumer choice; multiattribute choice; response time; context effects

1 Introduction

Consumer preferences often depend on the choice context. A classic example is the attraction effect: adding an asymmetrically dominated decoy can increase the choice share of the option that dominates it (Huber et al., 1982; Simonson, 1989). This pattern violates regularity and independence from irrelevant alternatives (Luce, 1977), and has made decoy effects a central case for theories of constructed preference, consumer judgment, and multiattribute decision making.

At the same time, the attraction effect is empirically delicate. It appears robustly in some settings, weakens or vanishes in others, and can sometimes reverse (Spektor et al., 2018, 2021, 2022; Trendl et al., 2021). This fragility suggests that the decoy's effect is not a simple response to nominal dominance. Instead, the decoy may influence preference only when the relevant comparisons are psychologically available and directionally diagnostic.

The present manuscript separates two ingredients that are often confounded in attraction-effect demonstrations. The first is *core-option ambiguity*: the target and competitor must be close enough that neither option has a settled pre-decoy advantage. The second is *decoy-related comparative asymmetry*: the target–decoy comparison must be easier, clearer, or more decisive than the competitor–decoy comparison. Core-option ambiguity creates room for influence; decoy-related comparative asymmetry supplies the direction of influence.

Prior demonstrations often vary these ingredients together. Difficult multiattribute trade-offs can make the target and competitor ambiguous while also making one decoy-related comparison easier than another (Luce et al., 2001; Hedgcock and Rao, 2009; Walasek and Brown, 2024). Such diagonal contrasts show that some stimulus families produce attraction and others do not, but they do not identify whether attraction depends on ambiguity, comparative asymmetry, or both.

The present experiment implements the critical off-diagonal test. Participants made choices among product packs described by quantity and price. The participant-facing task was a consumer value comparison, but the size–price pairs were constructed using ratio-comparison principles from the fraction comparison literature (Lortie-Forgues et al., 2015; Park et al., 2021). This controlled construction made it possible to hold Target–Competitor comparability approximately constant while manipulating the relative ease of Target–Decoy and Competitor–Decoy comparisons.

This product-pack format is useful because many marketplace attributes are ratio-like. Unit price, serving size, calories per serving, concentration, storage per dollar, price per feature, discount rate, and warranty per cost can make some pairwise comparisons transparent and others awkward. The present claim is not that consumers are solving bare fraction problems. Rather, ratio-like product information can alter the realized pairwise comparison structure of a choice set.

1.1 Hypotheses

The primary prediction was that attraction would track decoy-related comparative asymmetry. The equal-weighted Relative Share of the Target (RSTew), defined within each block as

$$\mathrm{RSTew} = \frac{1}{2}\left(\frac{n_{T,\mathrm{big}}}{n_{T,\mathrm{big}} + n_{C,\mathrm{big}}} + \frac{n_{T,\mathrm{small}}}{n_{T,\mathrm{small}} + n_{C,\mathrm{small}}}\right),$$

should be above chance in the High ΔDiff block and near chance in the Low ΔDiff block, with a reliable within-subject High–Low difference. Block order was included as a counterbalanced control rather than as a theoretical variable.

The response-time analyses were secondary process diagnostics. If deliberation mainly supports rejection of the decoy, then decoy choice should decrease with log response time. If attraction reflects gradual target preference build-up within the Target–Competitor pair, then conditional target choice should increase with response time after decoy choices are excluded. In contrast, the decoy-elimination account predicts that Target–Competitor preference should be approximately RT-invariant once the decoy is conditioned out.

2 Method

2.1 Transparency

The experiment was not preregistered. The High-vs-Low RSTew contrast is presented as the primary theory-driven test in this manuscript; response-time models and quartile decompositions are presented as secondary convergent process evidence. Materials, analysis-ready data, analysis scripts, output tables, and figure code will be made available on OSF. TODO: add OSF URL.

2.2 Participants

Fifty-seven adult participants completed the within-subject product-pack task. Two participants were excluded prior to analysis because complete data across both ΔDiff blocks could not be reconstructed. The retained sample comprised $N = 55$ participants (39 male, 16 female; age range 18–36 years, $M = 21.65$, $SD = 3.35$). Participants were recruited from a local university subject pool, provided informed consent, and were compensated according to institutional guidelines. TODO: anonymize ethics approval and compensation details for submission.

2.3 Stimuli and Design

Each trial presented three options: a Target (T), a Competitor (C), and a Decoy (D). Options were described as alternative packs of the same consumer product category, with each pack defined by quantity and price. The decoy was asymmetrically dominated by the target but not by the competitor.

The primary manipulation was ΔDiff, defined as the ease of the Target–Decoy comparison minus the ease of the Competitor–Decoy comparison:

$$\Delta\mathrm{Diff} = \mathrm{Ease(TD)} - \mathrm{Ease(CD)}.$$

In the High ΔDiff condition, Target–Decoy comparisons were expected to be substantially easier than Competitor–Decoy comparisons. In the Low ΔDiff condition, this asymmetry was reduced. Target–Competitor ease was held approximately constant by construction.

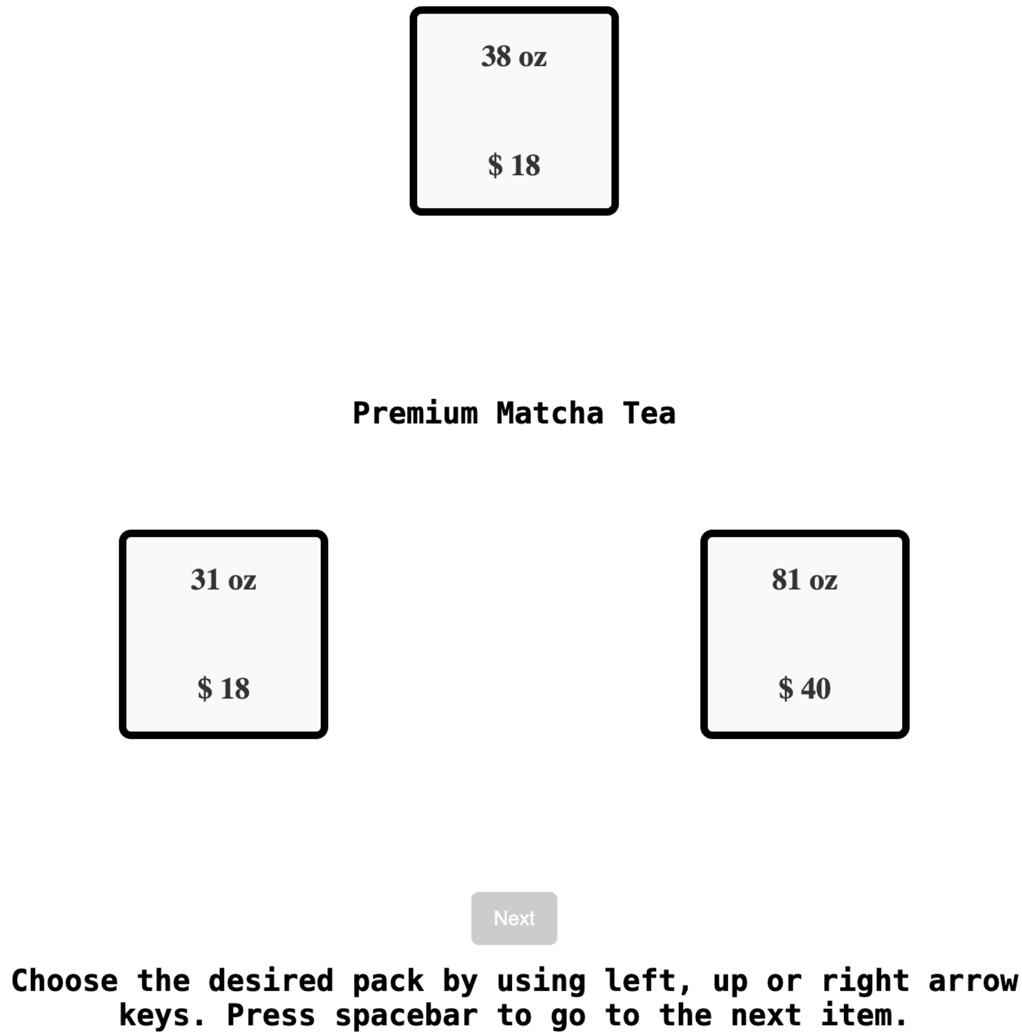

Figure 1: Example product-pack trial. Each option is described by quantity and price. The stimulus-construction procedure manipulates decoy-related comparative asymmetry while keeping the Target–Competitor relation approximately stable. TODO: replace with publication-ready anonymized figure.

The experiment used a within-subject design with two blocks, one High ΔDiff block and one Low ΔDiff block. Block order was counterbalanced (High–Low: $n = 30$; Low–High: $n = 25$). On each trial, the three options were shown simultaneously in randomized spatial positions, and participants selected their preferred option by clicking on it. No response deadline was imposed.

2.4 Manipulation Validation

A separate pair-rating validation study assessed whether the intended pairwise difficulty manipulation was psychologically realized. The subjective Competitor–Decoy minus Target–Decoy difficulty gap was larger in the High ΔDiff condition than in the Low ΔDiff condition, while Target–Competitor difficulty was approximately stable across conditions. In the validation sample ($N = 48$ after catch-based exclusions), the CD–TD gap was larger in High ΔDiff ($M = 1.01$, $SD = 0.72$) than in Low ΔDiff ($M = 0.27$, $SD = 0.29$), paired $t(47) = 7.84$, $p < .001$, $d_z = 1.13$, whereas Target–Competitor difficulty did not differ across blocks, $t(47) = -0.03$, $p = .977$. Full validation details and robustness tests are reported in the Methodological Detail Appendix.

2.5 Response-Time Processing

Response times were measured from stimulus onset to choice selection. Trial-level observations were removed if RT was less than 100 ms or exceeded the participant-specific upper bound $Q_3 + 1.75 \times \mathrm{IQR}$. This rule removed 820 trials (11.9% of the cleaned trial pool), yielding 6,062 valid trials from 55 participants. The Target-vs-Competitor model was estimated on the 5,549 trials in which participants selected either the target or the competitor. The remaining 513 trials were decoy selections and were retained for the decoy-elimination model and quartile decomposition.

2.6 Analytic Strategy

The analysis proceeded in three stages. Stage 1 tested the primary High-vs-Low RSTew contrast and the block-order control. Stage 2 used Bayesian multilevel logistic regressions to examine decoy elimination and conditional Target–Competitor choice as functions of log response time. Stage 3 used within-participant RT quartiles as a descriptive, model-free visualization of how choice probability was redistributed across Target, Competitor, and Decoy responses. Full model formulas, priors, diagnostics, and supplementary analyses are reported in the Methodological Detail Appendix.

3 Results

3.1 Primary RSTew Contrast

The aggregate RSTew pattern supported the primary prediction. In the High ΔDiff block, RSTew was reliably greater than chance ($M = .550$, $SD = .102$; $t(54) = 3.61$, $p < .001$, $d = 0.49$; $\mathrm{BF}_{10} = 39.29$). In the Low ΔDiff block, RSTew did not differ from chance ($M = .506$, $SD = .082$; $t(54) = 0.53$, $p = .600$, $d = 0.07$; $\mathrm{BF}_{10} = 0.17$), providing substantial evidence in favor of the null under the reported Bayes factor. A paired-samples comparison confirmed higher RSTew in the High than Low condition ($M_{\text{diff}} = .044$, $SD = .100$; $t(54) = 3.24$, $p = .002$, $d_z = 0.44$. TODO: add confidence intervals for High RSTew, Low RSTew, and the High–Low difference.

A Monte Carlo permutation test with 10,000 resamples found no evidence that block order influenced the within-subject attraction effect (observed mean difference = $-.019$, permutation $p = .485$).

3.2 Decoy Elimination

The decoy-elimination model showed that decoy selection decreased with log response time ($\beta = -0.88$, 95% CrI $[-1.03, -0.73]$), corresponding to an odds ratio of approximately 0.41 per unit of logRT. The logRT × ΔDiff interaction was positive but small ($\beta = 0.19$, 95% CrI $[0.05, 0.33]$), indicating attenuation rather than reversal: decoy choice decreased with RT in both blocks. Block order had no credible main effect ($\beta = 0.08$, 95% CrI $[-0.61, 0.76]$).

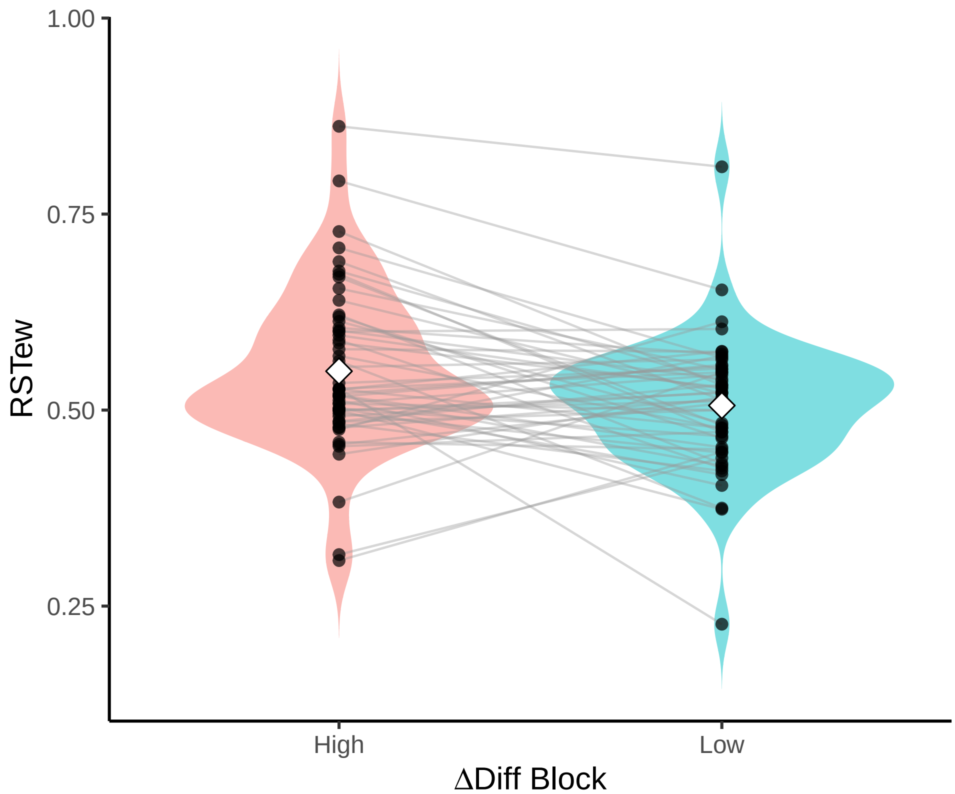

Figure 2: Within-participant RSTew distributions in the Low and High ΔDiff blocks. Grey lines connect participant-level values; white diamonds denote condition means. TODO: replace with JCP-formatted figure.

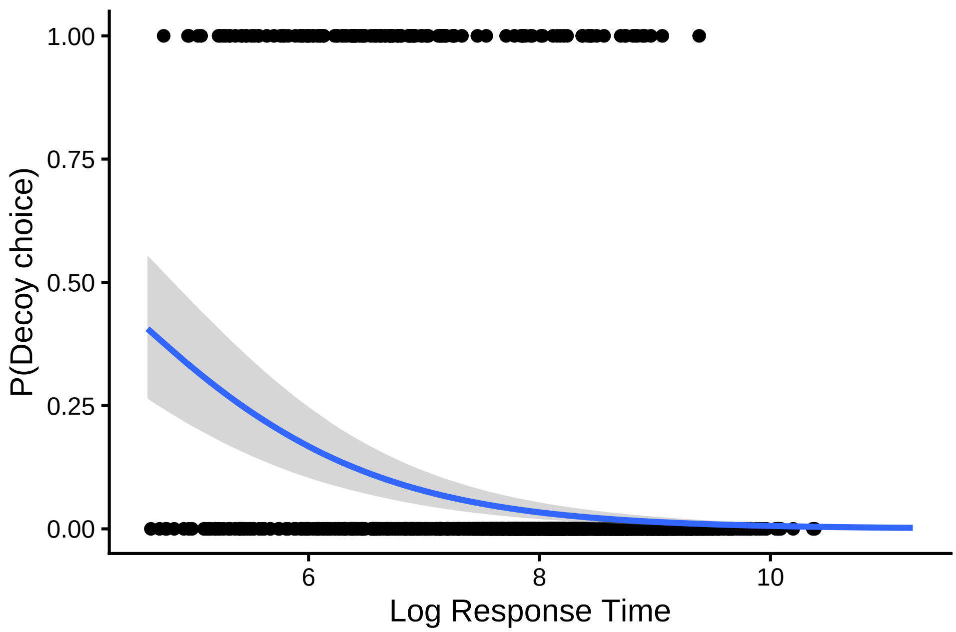

Figure 3: Model-predicted probability of decoy choice as a function of log response time. TODO: verify plotting range and visual transparency for publication.

3.3 Conditional Target–Competitor Preference

On Target/Competitor trials, the marginal effect of logRT on target choice was small and uncertain ($\beta = 0.05$, 95% CrI $[-0.05, 0.14]$). None of the interactions involving logRT showed credible evidence of direction. Posterior cell-conditional logRT slopes derived using `emmeans::emtrends` were uniformly small and compatible with zero. Between 88.3% and 99.3% of posterior mass for the four cell slopes lay inside the ROPE $[-0.10, +0.10]$ on the log-odds scale; the full ROPE summary and pairwise slope-contrast tables are reported in the Methodological Detail Appendix.

Cell	Posterior median	95% HPD
Low ΔDiff | HL	+0.047	[−0.046, +0.143]
High ΔDiff | HL	+0.011	[−0.085, +0.102]
Low ΔDiff | LH	+0.020	[−0.074, +0.118]
High ΔDiff | LH	+0.021	[−0.078, +0.111]

Table 1: Cell-conditional posterior slopes of logRT on log-odds of target choice among Target/Competitor trials.

3.4 Quartile Decomposition

Within-participant response-time quartiles provided descriptive support for the model-based decomposition. Across block-order and ΔDiff cells, decoy choice declined with RT quartile, while Target and Competitor curves tracked each other closely. Thus, the apparent growth of target choice over time in aggregate choice shares is better characterized as decoy elimination redistributing probability mass between the two surviving options than as monotonic strengthening of target preference.

4 Discussion

The present experiment isolated decoy-related comparative asymmetry from core-option ambiguity in a controlled consumer product-pack choice task. When the Target–Decoy comparison was much easier than the Competitor–Decoy comparison, the equal-weighted relative share of the target rose above chance. When that comparative asymmetry was reduced while Target–Competitor comparability was held approximately stable, the attraction effect returned to chance. This pattern supports the claim that the decoy's leverage depends on the realized comparative structure of the choice set, not merely on nominal asymmetric dominance.

The response-time results further constrain the interpretation of attraction. Longer response times strongly predicted rejection of the decoy, but did not reliably tilt preference toward the target once decoy choices were excluded. This pattern is more consistent with a decoy-elimination account than with a simple target preference build-up account. The present analyses are not direct process tracing; eye tracking, mouse tracking, or other comparison-sequence measures would be needed to observe the comparison process directly.

The consumer implication is deliberately narrow. Product-pack quantity and price formats can be arranged so that some pairwise comparisons are easier than others, changing whether an asymmetrically dominated product has leverage. Broader claims about digital interfaces and comparison architecture should be developed with evidence that directly manipulates information access and pairwise co-display. In the present manuscript, the relevant contribution is about ratio-like product information and the comparison structure it creates.

Several limitations define the scope of the evidence. First, the experiment used controlled two-attribute product-pack stimuli rather than richer branded marketplace displays. This was necessary for identification, but it leaves open how the mechanism generalizes to naturalistic product domains. Second, the experiment contrasted two ΔDiff levels; a continuous manipulation would better characterize the functional form relating comparative asymmetry to attraction. Third, the experiment was not preregistered. The primary contrast is theory-driven and the full analysis package will be shared, but a future consumer-domain replication should be preregistered before data collection.

5 Data Availability

Materials, analysis-ready data, analysis scripts, output tables, and figure code will be made available on OSF.

References

Hedgcock, W. and Rao, A. R. (2009). Trade-off aversion as an explanation for the attraction effect: A functional magnetic resonance imaging study. *Journal of Marketing Research*, 46(1):1–13.

Huber, J., Payne, J. W., and Puto, C. (1982). Adding asymmetrically dominated alternatives: Violations of regularity and the similarity hypothesis. *Journal of Consumer Research*.

Lortie-Forgues, H., Tian, J., and Siegler, R. S. (2015). Why is learning fraction and decimal arithmetic so difficult? *Developmental Review*, 38:201–221.

Luce, M. F., Bettman, J. R., and Payne, J. W. (2001). Emotional decisions: Tradeoff difficulty and coping in consumer choice. *Monographs of the Journal of Consumer Research*, 1(1):1–209.

Luce, R. D. (1977). The choice axiom after twenty years. *Journal of Mathematical Psychology*, 15(3):215–233.

Park, Y., Viegut, A. A., and Matthews, P. G. (2021). More than the sum of its parts: Exploring the development of ratio magnitude versus simple magnitude perception. *Developmental Science*, 24(3):e13043.

Simonson, I. (1989). Choice based on reasons: The case of attraction and compromise effects. *Journal of Consumer Research*, 16(2):158–174.

Spektor, M. S., Bhatia, S., and Gluth, S. (2021). The elusiveness of context effects in decision making. *Trends in Cognitive Sciences*, 25(10):843–854.

Spektor, M. S., Kellen, D., and Hotaling, J. M. (2018). When the good looks bad: An experimental exploration of the repulsion effect. *Psychological Science*, 29(8):1309–1320.

Spektor, M. S., Kellen, D., and Klauer, K. C. (2022). The repulsion effect in preferential choice and its relation to perceptual choice. *Cognition*, 225:105164.

Trendl, A., Stewart, N., and Mullett, T. L. (2021). A zero attraction effect in naturalistic choice. *Decision*, 8(1):55–68.

Walasek, L. and Brown, G. D. A. (2024). Incomparability and incommensurability in choice: No common currency of value? *Perspectives on Psychological Science*, 19(6):1011–1030.