Mapping Context Effects Across Preference, Perception, And Belief-based Judgments

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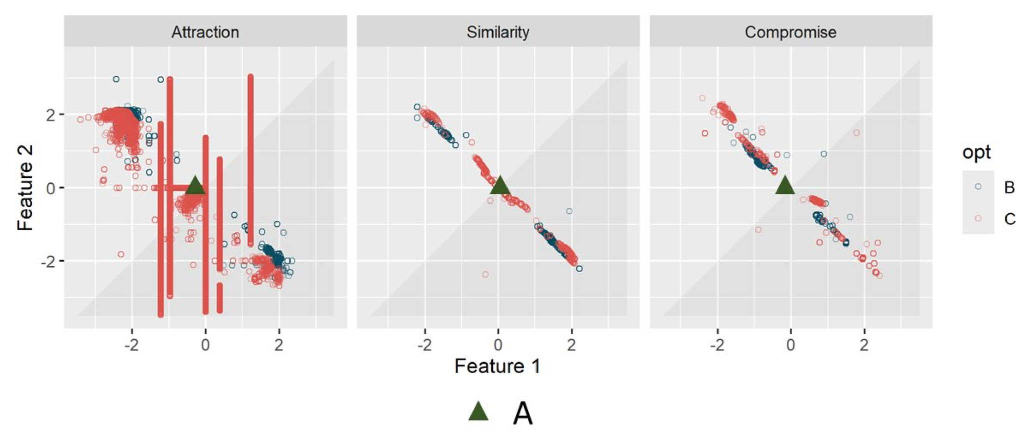
Introduction

What Are The Context Effects?

The evaluation of an option is systematically influenced by the other options under consideration. Introducing a distractor that is dominated by a target typically enhances the target's attractiveness (attraction effect), while adding an extreme distractor can position the target as an appealing compromise (compromise effect). Conversely, introducing a distractor similar to the target generally reduces the target's attractiveness (similarity effect).

Do context effects reliably emerge when options are sampled across the entire attribute space?

Figure 1. **Transformed stimuli from 57 papers in a preliminary meta-analysis.** Attributes were recoded so that higher values reflect higher preference, then standardized within each test set, defined by a A-B pair and associated distractors (CA1, ..., CB1, ...).



- Transformed stimuli were clustered in a limited region of the attribute space.
- Past studies have largely focused on a restricted region of the attribute space.

Does a distractor from the overlapping region elicit a similarity or compromise effect?

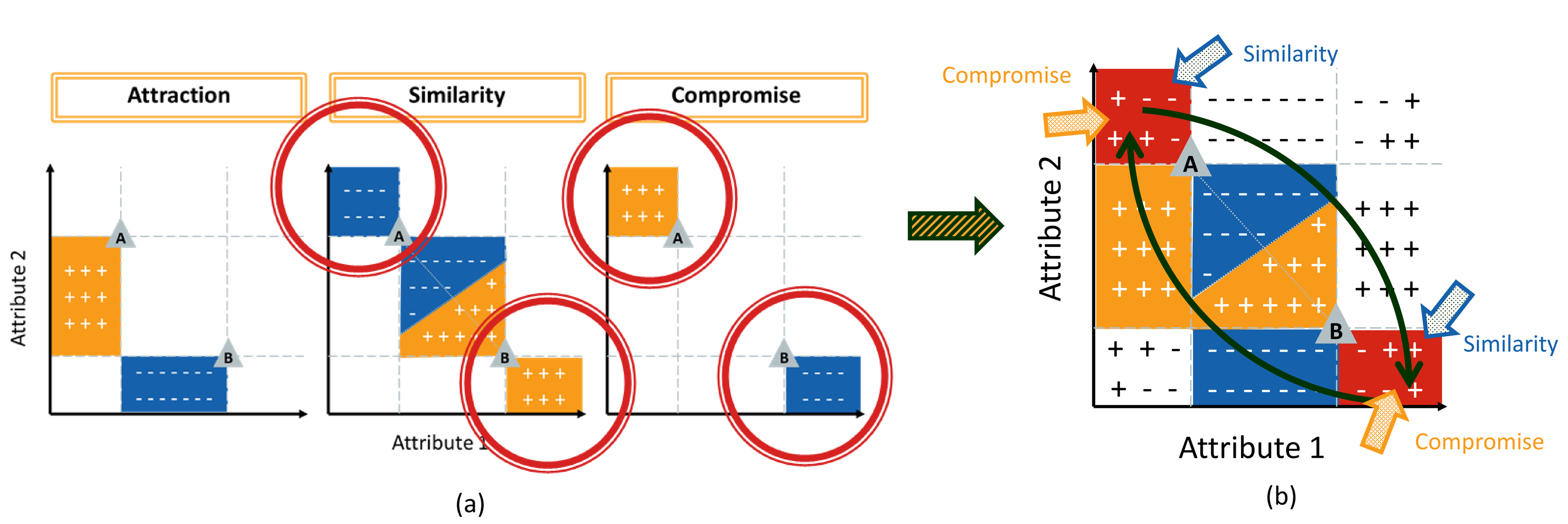


Figure 2. (a) **The potential positions of distractor options for eliciting the attraction, similarity, and compromise effects**. Distractors in the yellow region increase the attractiveness of *A* over *B* (+), while those in the blue region decrease it (–). When the distractor falls within the red-circled overlapping, it is unclear whether it will make the target (e.g., *A*) more attractive (as in the compromise effect) or less attractive (as in the similarity effect). (b) **Predicted changes in the relative attractiveness of *A* over *B* across the full attribute space when a distractor is introduced.** Plus and minus signs denote increases and decreases in relative attractiveness, respectively. The red region corresponds to the ambiguous overlap identified in panel (a), while the yellow and blue regions mirror those associated with the attraction, similarity, and compromise effects in panel (a). The observed pattern across these regions reveals a broader trend: as a distractor moves in the direction indicated by the green arrows, the relative attractiveness of *A* over *B* tends to increase. This pattern allows for informed predictions about the impact of distractors from the red and white regions.

How do target–competitor and target–distractor relationships influence the three context effects?

- Target-competitor (A-B) relationship
  - Attraction effect is most pronounced when the target and competitor are roughly equally attractive (Huber et al., 2014, Farmer et al., 2017)
- Target-distractor (A–C_A) relationship
  - Attraction effect strength varies by distractor type (Huber et al., 1982, Trueblood et al., 2013)
  - Attraction effect becomes stronger as the target-distractor distance increases (Spektor et al. , 2018, Fang et al., 2024).

Does the general context effect behave similarly across domains?

- Domain-general? → Context effects are observed in various scenarios such as personal preferences, perceptual tasks, and belief formation.
- Domain-specific? → The target-distractor distance influences the strength and direction of the attraction effect differently in perceptual and preferential decisions (Liao et al., 2021).

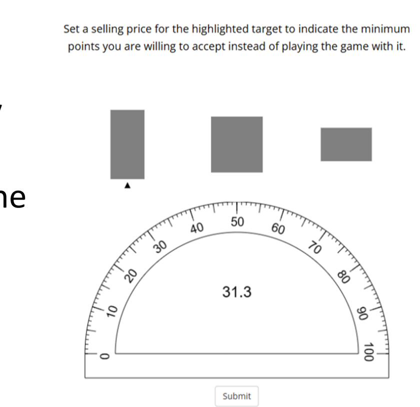
Questions

How does distractor position influence context effects?
Does the general context effect behave similarly across preference, perception, and belief?

METHODS

- **Design**:
  - Context effects were measured across preference (Study 1), perception (Study 2), and belief (Study 3) domains using the Ballon Drop Game Paradigm.
  - The only difference across studies was the task and reward structure.
- **The Ballon Drop Game Paradigm:**
  - In each round, 1,000 balloons floated down to 2 or 3 stationary rectangles. The first rectangle to intercept a balloon won 100 points; others received 0 points.
  - On each trial, participants make a judgment about the highlighted rectangle.

Figure 3. **Example trial from the three-option condition in the preference domain.** In the perception domain, the task was: "Estimate the probability that the highlighted target will touch a balloon first and win the game." In the belief domain, the task was: "Estimate the percentage of the area of the highlighted target relative to the combined area of all targets."



- **Stimuli Design:**
  - Each participant received a unique set of stimuli.
  - For Each Participant, 4 Target–Competitor (*A*–*B*) pairs were randomly selected.
  - For Each *A*–*B* Pair, 27 Distractor (*C*) options were generated.
    - The attribute space was divided into a 3 × 3 grid, yielding 9 regions.
    - 3 C options were sampled per region:
      - Width and length ranges were divided into three equal segments.
      - One value was randomly drawn from each segment.
      - Values were randomly paired to form 3 distinct distractors per region

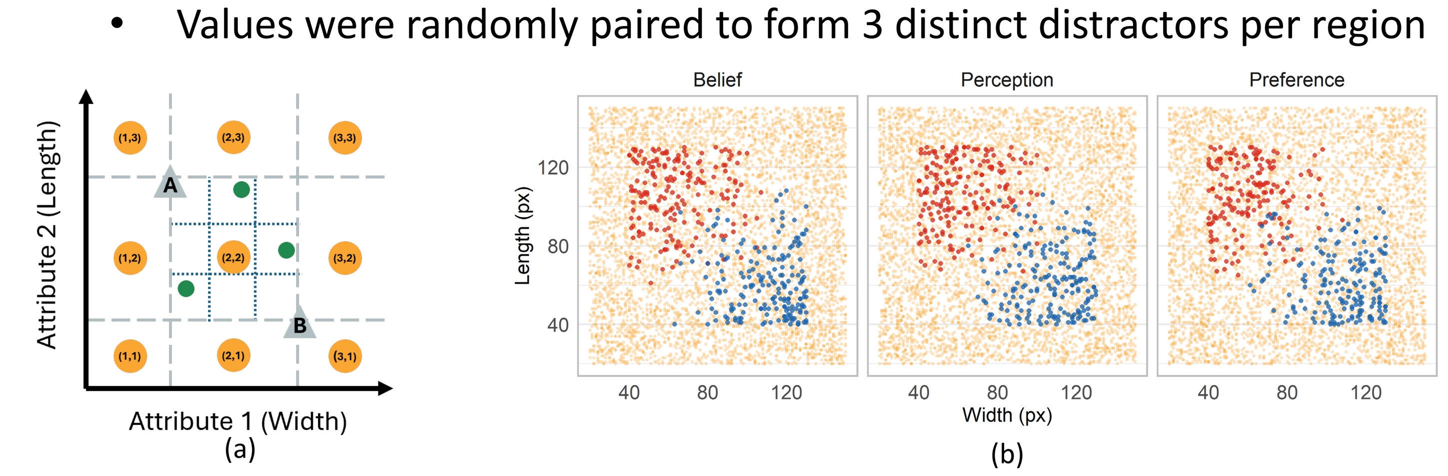


Figure 4. (a) Illustration of stimulus selection for constructing an A-B context-effect map. (b) Stimuli used in all three studies.

ANALYSES

- Data selection: Options *A* and *B* were evaluated in three-option experimental trials
- Bayesian multilevel regression models
  - DV: *A-B* ratio: $\frac{\text{Judgment }(A)}{\text{Judgment }(A)+\text{Judgment}(B)}$ (logit transformed)
  - IVs:
    - *A-B* area: $\frac{A\ area}{A\ area + B\ area}$
    - *C* area: $\frac{C\ area}{A\ area + B\ area + C\ area}$
    - *A-C* angle: θ
    - Domain
    - Interactions
  - All continuous variables were standardized
  - Random intercepts by participants

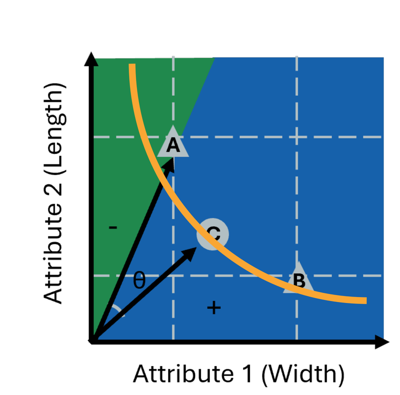


Figure 5. Illustration of the A–C angle

RESULTS

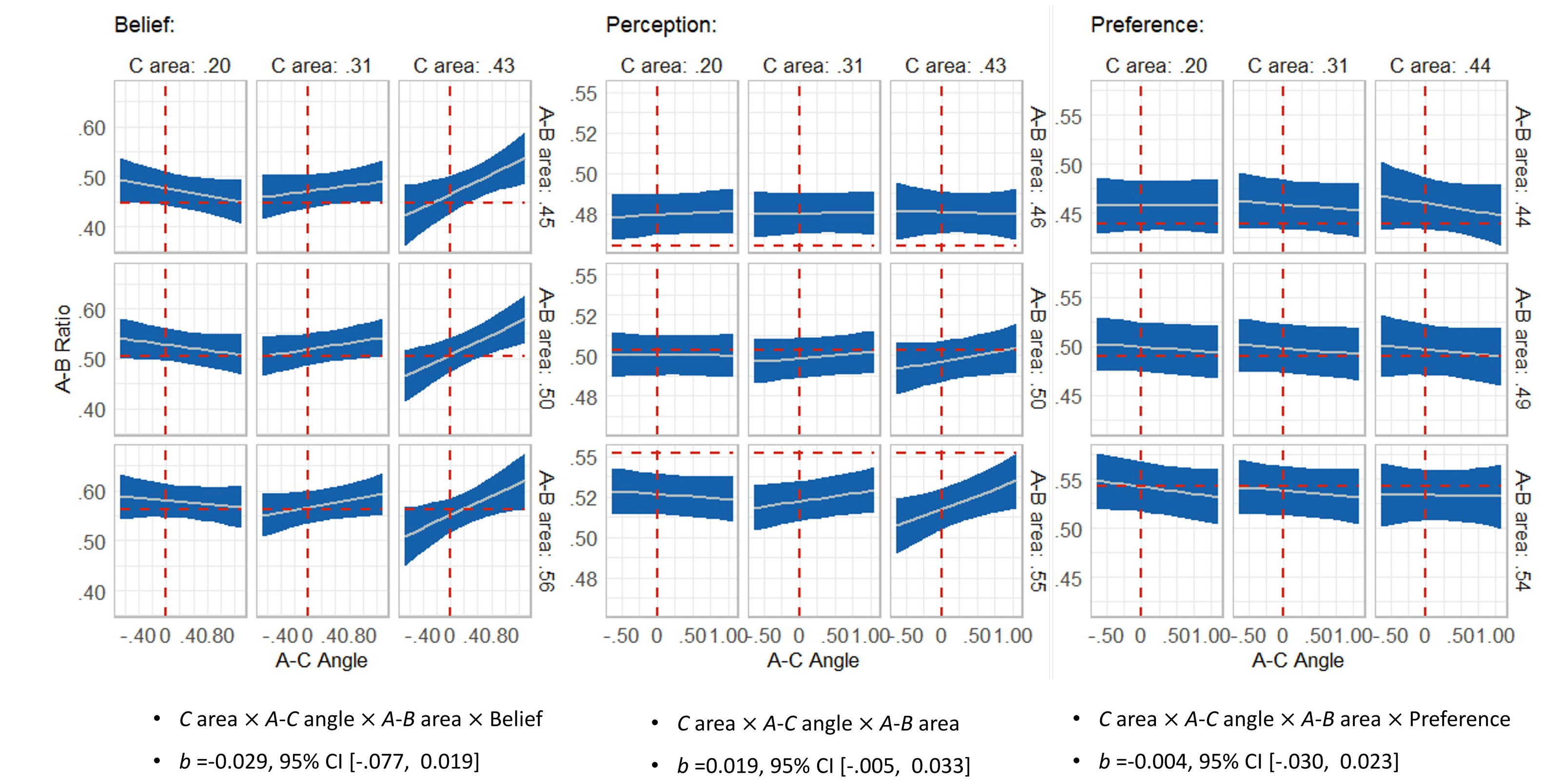


Figure 6. **This figure illustrates how the *A-C* angle, *C* area, and *A-B* area influence the *A-B* ratio across the belief, perception, and preference.** Within each panel, the posterior predicted *A-B* ratios are plotted as a function of the *A-C* angles, separately for cases in which *C* area and *A-B* area are set to their first, second, and third sample quantiles. The gray lines are the posterior predicted means of *A-B* ratios. The blue bands are the 95% credible interval of the mean of *A-B* ratios. The horizontal red dash line indicates the corresponding value of the *A-B* area, and the vertical red dashed line indicates an *A-C* angle of zero.

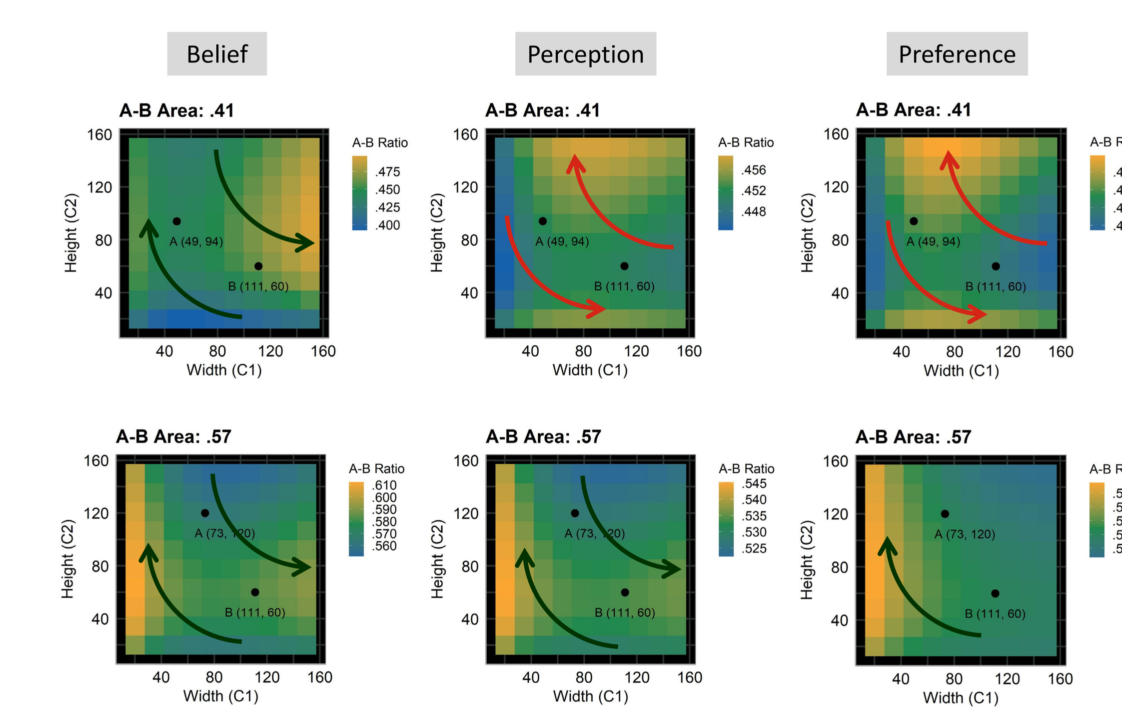
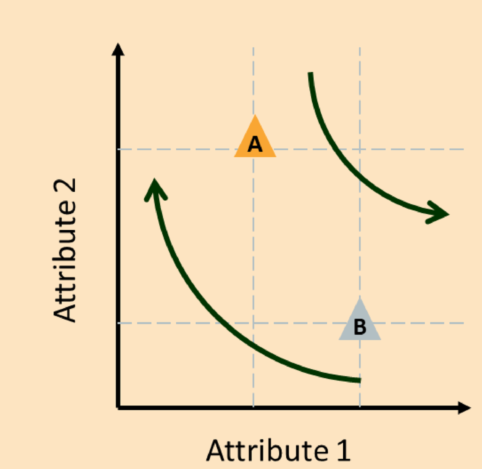


Figure 7. **Examples of posterior predictive context effect maps.** Each map illustrates how the posterior predictive mean of the *A-B* ratio varies as option *C* is positioned at different locations in the attribute space for a given *A* and *B*. The color represents the posterior predictive mean of the *A-B* ratio, with green indicating locations where the ratio equals the average posterior predictive mean across all *C* positions for that *A-B* pair.

- The relative evaluation between options *A* and *B* is influenced by position of the third option. This influence was consistent across all three judgment domains.
- When *A*–*B* area difference was large and *C*'s area was small, increasing the *A*–*C* angle led to a decrease in the *A*–*B* ratio. However, this effect reversed as the *C* area increased. The pattern weakened as the *A*–*B* area difference decreased, eventually showing a trend toward reversal.

Take Home Messages



- For a pair of options *A* and *B*, where *A* > *B* (*A* is stronger):
  - When a weaker third option becomes more similar to *A*, *A* becomes more competitive relative to *B*.
  - When a stronger third option becomes less similar to *A*, *A* also becomes more competitive relative to the *B*.
- This pattern holds consistently across preference, perception, and belief domains.