



The comparison process as an account of variation in the attraction, compromise, and similarity effects

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Abstract

Context effects are changes in preference that occur when alternatives are added to a choice set. Models that account for context effects typically assume a within-dimension comparison process; however, the presentation format of a choice set can influence comparison strategies. The present study jointly tests the influence of presentation format on the attraction, compromise, and similarity effects in a within-subjects design. Participants completed a series of choices designed to elicit each of the three context effects, with either a by-alternative or by-dimension format. Whereas the by-alternative format elicited a standard similarity effect, but null attraction and reverse compromise effects, the by-dimension format elicited standard attraction and compromise effects, but a reverse similarity effect. These novel results are supported by a re-analysis of the eye-tracking data collected by Noguchi and Stewart (*Cognition*, 132(1), 44–56, 2014) and demonstrate that flexibility in the comparison process should be incorporated into theories of preferential choice.

Keywords Context effects · Attraction effect · Compromise effect · Similarity effect · Information presentation format

Introduction

Preferential choice scenarios, such as choosing an apartment, restaurant, or laptop, are ubiquitous. An important collection of results demonstrates that adding an alternative to a choice set can change preferences among the original alternatives. The attraction, compromise, and similarity effects are three well-studied examples of these “context effects.” To demonstrate, consider the scenario of choosing between apartments that vary in their rated size and location (Fig. 1). Assuming both dimensions are equally important, a choice between Apartments X and Y would be difficult – whereas Apartment X rates well on location, but poorly on size, the reverse is true for Apartment Y. The attraction effect (Huber, Payne, & Puto, 1982) is when the availability of Apartment A_X , which is similar to, but dominated by, Apartment X,

increases preference for Apartment X relative to Apartment Y. The compromise effect (Simonson, 1989) is when the availability of Apartment C_X increases preference for Apartment X, which now has intermediate values on both dimensions, relative to Apartment Y. The similarity effect (Tversky, 1972) is the finding that the availability of Apartment S_X , which is similar to, but not dominated by, Apartment Y, increases preference for Apartment X relative to Apartment Y.

These effects serve as central examples of how the decision process deviates from rationality (e.g., Roe, Busemeyer, & Townsend, 2001) and are therefore often used as theoretical benchmarks. Indeed, many computational models of preferential choice strive to account for all three effects simultaneously (Bhatia, 2013; Noguchi & Stewart, 2018; Roe et al., 2001; Trueblood, Brown, & Heathcote, 2014; Usher & McClelland, 2004). Behavioral data, however, suggest that this constraint may be premature (Trueblood, Brown, & Heathcote, 2015). For example, a number of studies have found the attraction and compromise effects to be positively correlated with each other but negatively correlated with the similarity effect (Berkowitsch, Scheibehenne, & Rieskamp, 2014; Liew, Howe, & Little, 2016; Trueblood et al., 2015). Further, it is not simply the case that particular effects do or do not occur in different scenarios (e.g., Frederick, Lee, & Baskin, 2014; Huber, Payne, & Puto, 2014); rather, the

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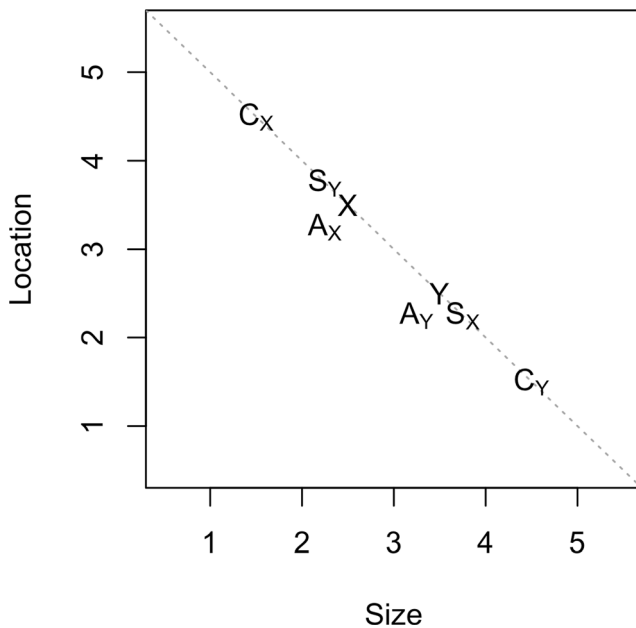


Fig. 1 Each label represents the dimension values of an apartment. Subscripts denote the apartment from the base pair X and Y targeted by the decoy. The presented ratings are for the 3 EV condition. The precise (Size, Location) stimulus values were as follows: X = (2.5, 3.5), Y = (3.5, 2.5), A_X = (2.25, 3.25), A_Y = (3.25, 2.25), C_X = (1.5, 4.5), C_Y = (4.5, 1.5), S_X = (3.75, 2.25), S_Y = (2.25, 3.75). For the 2 EV condition, all ratings were one unit lower

occurrence of *reversed* effects suggests a more diverse landscape of context-dependent choice (Cataldo & Cohen, 2018; Spektor, Kellen, & Hotaling, 2018). Thus, it is important for theories of preferential choice to consider how context effects co-vary and what factors influence their presence, absence, or reversal.

The processes underlying context effects have been a central point of debate between theories of preferential choice; however, there is evidence to suggest that the information-acquisition process may play a primary role. Most recent models assume that choice information is compared between alternatives within a single dimension (Bhatia, 2013; Noguchi & Stewart, 2018; Roe et al., 2001; Trueblood et al., 2014; Usher & McClelland, 2004; Wollschläger & Diederich, 2012). Work by Chang and Liu (2008) and Cataldo and Cohen (2018), however, suggests the need to consider a more flexible process. These studies show that differences in presentation format (Bettman & Kakkar, 1977; Biehal & Chakravarti, 1982) can modulate context effects, implicating the information-acquisition process. Specifically, whereas the compromise effect is facilitated by a format encouraging within-dimension comparisons and impeded by a format encouraging within-alternative comparisons (Chang & Liu, 2008), the opposite is found for the similarity effect (Cataldo & Cohen, 2018). Together, these studies suggest that a flexible comparison process may be a key mechanism underlying the correlations between context effects (Berkowitsch et al., 2014;

Trueblood et al., 2015) and individual differences (Liew et al., 2016) by differentially highlighting dimension-level (e.g., extremeness and dominance; Simonson, 1989) and alternative-level (e.g., dimension dispersion; Chernev, 2004, 2005) stimulus characteristics.

The present research targets a flexible comparison process as a critical mechanism driving diversity in context-dependent choice. To date, the effect of format on the attraction effect has not been tested. Furthermore, the compromise (Chang & Liu, 2008) and similarity (Cataldo & Cohen, 2018) effects were tested in two different paradigms with between-subject format manipulations. We extend previous work by jointly testing the influence of presentation format on all three context effects in an entirely within-subjects design. These methodological changes allow a unified view of the role of the comparison process in context-dependent choice. The current data also allow for response-time analysis, which has not been considered in this framework.

Following previous work (Cataldo & Cohen, 2018; Chang & Liu, 2008), we predicted that a by-dimension format would produce strong compromise and reverse similarity effects, but that a by-alternative format would produce reverse compromise and strong similarity effects. Given previously observed correlations between context effects (e.g., Berkowitsch et al., 2014), we predicted that a by-dimension format would produce a strong attraction effect, but a by-alternative format would produce a weakened attraction effect. The data support these choice predictions. Furthermore, longer response times in the by-dimension condition suggest a process that requires greater deliberation. We conclude with a re-analysis of the eye-tracking data collected by Noguchi and Stewart (2014) demonstrating that, while the compromise effect is driven by a greater number of transitions within dimensions, the similarity effect is driven by a greater number of transitions within alternatives.

Method

Participants

Four-hundred and seventy undergraduates from UMass Amherst participated for course credit. The sample size was selected to be larger than that used in past work eliciting simultaneous context effects (Berkowitsch et al., 2014; Liew et al., 2016; Noguchi & Stewart, 2014). Following previous work (Cataldo & Cohen, 2018), participants were excluded for failing more than four of 24 catch trials. Thirty-four participants were excluded, leaving 436 in the analyses. Separate analyses including all participants and excluding 198 who failed any catch trial are provided in the [Supplementary Materials](#), but yield the same qualitative results.

Materials

Each choice set consisted of three apartments varying on size and location. Every test trial included Apartments X and Y. The unweighted mean of X and Y were always equivalent; that is, assuming no dimension bias, X and Y were of equal overall value. For generalizability, the unweighted mean (EV) of X and Y was varied (either 2 or 3). The size and location dimension values in the 3 EV condition are described in Fig. 1, and the 2 EV dimension values are one unit less.¹

The third apartment was either A_X or A_Y for the attraction effect, C_X or C_Y for the compromise effect, and S_X or S_Y for the similarity effect. These stimuli will be collectively referred to as decoy stimuli (D). The subscripts index the target alternative, i.e., whether adding the decoy is expected to increase choices for Apartment X or Y. The non-target, non-decoy alternative will be referred to as the competitor. The distances from A and S to the nearby alternative were equal and subjectively selected to be as small as possible while remaining perceptually distinct.

Following Tversky (1972, Task B) and Cataldo and Cohen (2018), the dimension values were depicted as filled, horizontal bars (see Fig. 2, center panels). The values were goodness-of-fit ratings, from “worst for me” (unfilled) to “best for me” (completely filled). This scale standardizes the dimensions and minimizes concerns about differences in preferred dimension directions, e.g., preferring small versus large apartments. The horizontal length of the bar was determined by multiplying the constant, vertical height of the bar (50 px) by the dimension rating.

The choice sets were displayed in one of two presentation formats – by-alternative or by-dimension. Consider the center panels of Fig. 2. The top and bottom rows show sample stimuli in the by-alternative and by-dimension conditions, respectively. In both cases, the ratings are presented as horizontal bars in a matrix, strongly encouraging comparisons within columns rather than within rows. In the by-alternative condition, the columns of the matrix denote alternatives and the rows denote dimensions, encouraging within-alternative comparisons. In the by-dimension condition, the columns denote dimensions and the rows denote alternatives, encouraging within-dimension comparisons. The bar lengths were constant across presentation format conditions. The size dimension was always presented on the top in the by-alternative condition and on the left in the by-dimension condition. For each choice set, participants saw all six possible alternative orderings, randomly ordered.

The factors described above were manipulated within-subject, resulting in 144 test trials for each participant: two target

conditions (D_X and D_Y) by two expected values (2 and 3) by three contexts (attraction, compromise, and similarity) by two presentation formats (by-alternative and by-dimension) by six alternative orderings.

To identify participants who were not sufficiently engaged, each participant also completed 24 catch trials that included a dominating apartment, resulting in a total of 168 choices.

Procedure

The trials were blocked by presentation format, with block order randomized across participants. Participants were told that the different formats represented different rental magazines. All other factor levels were randomly ordered within each block.² Participants were given detailed instructions at the beginning of each block, including the meaning of the dimensions, a description of the rating scale, and a preview of the presentation format. Participants completed three practice trials before the test trials. Each response involved a key press (1, 2, or 3) corresponding to the desired alternative.

Results

Choice

Following Wedell (1991), we measure each context effect as a comparison between two three-choice scenarios targeting X or Y. A context effect is obtained if both $\Delta P_X = P(X | X, Y, D_X) - P(X | X, Y, D_Y)$ and $\Delta P_Y = P(Y | X, Y, D_Y) - P(Y | X, Y, D_X)$ are positive. Negative values indicate a reverse effect. The left panels of Fig. 2 show ΔP for X and Y for each context effect and presentation format.

Participants in the by-alternative condition (top row) display a classic similarity effect, but a weak or null attraction effect and a reversed compromise effect. That is, S_X and S_Y increase preference for the target, but A_X and A_Y have little effect on choice proportions, and C_X and C_Y actually *decrease* preference for the target.

In perfect contrast, participants in the by-dimension condition (bottom row) display classic attraction and compromise effects, but a reversed similarity effect. That is, whereas A_X , A_Y , C_X , and C_Y increase preference for the target, S_X and S_Y *decrease* preference for the target.

A hierarchical Bayesian conditional logistic regression model was used to test for differences in choice proportions across target, EV, context, and presentation format conditions. Details of the model are provided in the [Supplemental](#)

¹ Due to a coding error, 227 participants were dropped from the 3 EV condition. A separate analysis excluding these participants is provided in the Supplementary Materials, and yields the same qualitative results.

² Participants who viewed the by-dimension format second exhibited a weakened effect. The Supplementary Materials include further discussion and analysis of this result. These analyses yield the same critical interactions as the full data set.



Fig. 2 Left: Mean differences in overall choice proportions for Alternatives X and Y in attraction, compromise, and similarity choice sets, when choice information is grouped by alternatives (top) and by dimensions (bottom). Error bars are between-subject standard errors. Middle: Sample stimuli depicting an apartment choice set grouped by

alternatives (top) and by dimensions (bottom). In this example, Apartments 1, 2, and 3 correspond to Apartments X, Y, and A_X in Fig. 1, respectively. Right: Mean response times broken down by target (X or Y) in attraction, compromise, and similarity choice sets, when choice information is grouped by alternatives (top) and by dimensions (bottom)

Material. Inferences are made by calculating the 95% highest density interval (HDI) around the mean of the posterior estimated choice proportions for a given condition. A difference between conditions is indicated by non-overlapping HDIs.

Consider the posterior estimates and HDIs for choice proportions provided in Table 1. First, as previewed above, the attraction decoy was selected least often. Second, there was a preference for X over Y, suggesting a bias for location. Third, there was no effect of expected value; thus, we collapse across expected value in all following analyses.

Next, we use this model to address which context effects were present. The estimated choice proportions and HDIs for ΔP_X and ΔP_Y are provided in Table 2, broken down by context and format. The null attraction effect, reverse compromise effect, and classic similarity effect observed in the by-alternative condition are all statistically supported. The ΔP_X and ΔP_Y HDIs for the attraction effect comfortably include zero. The HDIs for the compromise effect are less than zero, demonstrating a change in preference towards the competitor. The HDIs for the similarity effect are greater than zero, demonstrating a change in preference towards the target.

The classic attraction and compromise effects and reverse similarity effect observed in the by-dimension condition are both statistically supported. The HDIs for the attraction and compromise effects are greater than zero, demonstrating a change in preference towards the target. The HDIs for the similarity effect are less than zero, indicating a change in preference towards the competitor.

It is important to note that the HDIs for ΔP_X and ΔP_Y are greater in the by-dimension condition for the attraction and compromise effects but greater in the by-alternative condition for the similarity effect. This result supports the hypothesis that the attraction and compromise effects are facilitated by a presentation format that encourages within-dimension comparisons but the similarity effect is facilitated by a presentation format that encourages within-alternative comparisons.

To ensure that the results are not due to averaging, it is informative to examine the results at the individual participant level (Berkowitsch et al., 2014; Cataldo & Cohen, 2018; Liew et al., 2016; Trueblood et al., 2015). Figure 3 summarizes the co-occurrence of the attraction (A), compromise (C), and similarity (S) effects within subjects. For each participant, each

Table 1 Posterior estimates and 95% HDIs for choice proportions by target, expected value (EV), context effect, and presentation format conditions

Factor	Level	P(X)			P(Y)			P(D)		
		M	HDI Low	HDI High	M	HDI Low	HDI High	M	HDI Low	HDI High
Target	X	0.526	0.523	0.531	0.356	0.352	0.359	0.118	0.115	0.120
	Y	0.500	0.496	0.504	0.378	0.373	0.381	0.122	0.119	0.125
EV	2	0.513	0.510	0.517	0.370	0.367	0.374	0.117	0.114	0.119
	3	0.513	0.509	0.517	0.363	0.360	0.367	0.123	0.120	0.126
Context effect	A	0.539	0.534	0.543	0.381	0.377	0.386	0.080	0.077	0.083
	C	0.521	0.516	0.525	0.364	0.360	0.369	0.115	0.112	0.118
	S	0.480	0.475	0.486	0.355	0.349	0.361	0.165	0.160	0.170
Format	By-Alt	0.538	0.534	0.542	0.348	0.344	0.352	0.114	0.111	0.117
	By-Dim	0.489	0.484	0.493	0.385	0.381	0.390	0.126	0.123	0.129

Notes: A, C, and S are the attraction, compromise, and similarity effects, respectively

Table 2 Posterior estimates and 95% HDIs for ΔP_X and ΔP_Y and their mean, broken down by context and presentation format

Presentation Format	Context	ΔP_X			ΔP_Y			Mean		
		M	HDI Low	HDI High	M	HDI Low	HDI High	M	HDI Low	HDI High
By-Alternative	A	0.008	-0.003	0.019	0.011	-0.000	0.021	0.009	-0.001	0.019
	C	-0.017	-0.029	-0.005	-0.015	-0.026	-0.004	-0.016	-0.027	-0.005
	S	0.049	0.035	0.062	0.031	0.018	0.043	0.040	0.028	0.052
By-Dimension	A	0.111	0.099	0.124	0.095	0.083	0.106	0.103	0.091	0.114
	C	0.046	0.034	0.059	0.049	0.036	0.060	0.047	0.035	0.059
	S	-0.038	-0.053	-0.023	-0.040	-0.054	-0.027	-0.039	-0.052	-0.026

Notes: $\Delta P_X = P(X | X, Y, D_X) - P(X | X, Y, D_Y)$, $\Delta P_Y = P(Y | X, Y, D_Y) - P(Y | X, Y, D_X)$. A, C, and S are the attraction, compromise, and similarity effects, respectively

effect was marked present (+) if the average of ΔP_X and ΔP_Y was greater than 0.04, reversed (-) if the average was less than 0.04, and null (0) otherwise.

The two most frequent response patterns for each presentation format are indicated by darker colors. The individual subject results are consistent with the group results. In the by-alternative condition, the modal response patterns included null or reversed attraction and compromise effects with a classic similarity effect (A-, C-, S+ or A0, C-, S+). In the by-dimension condition, there was an especially clear result.

That is, participants were much more likely to display classic attraction and compromise effects with a reversed similarity effect (A+, C+, S-). Far less likely was a null attraction effect, reversed compromise effect, and classic similarity effect (A0, C-, S+).

Response times

The right panels of Fig. 2 present mean response times corresponding to the conditions presented in the left panels of Fig.

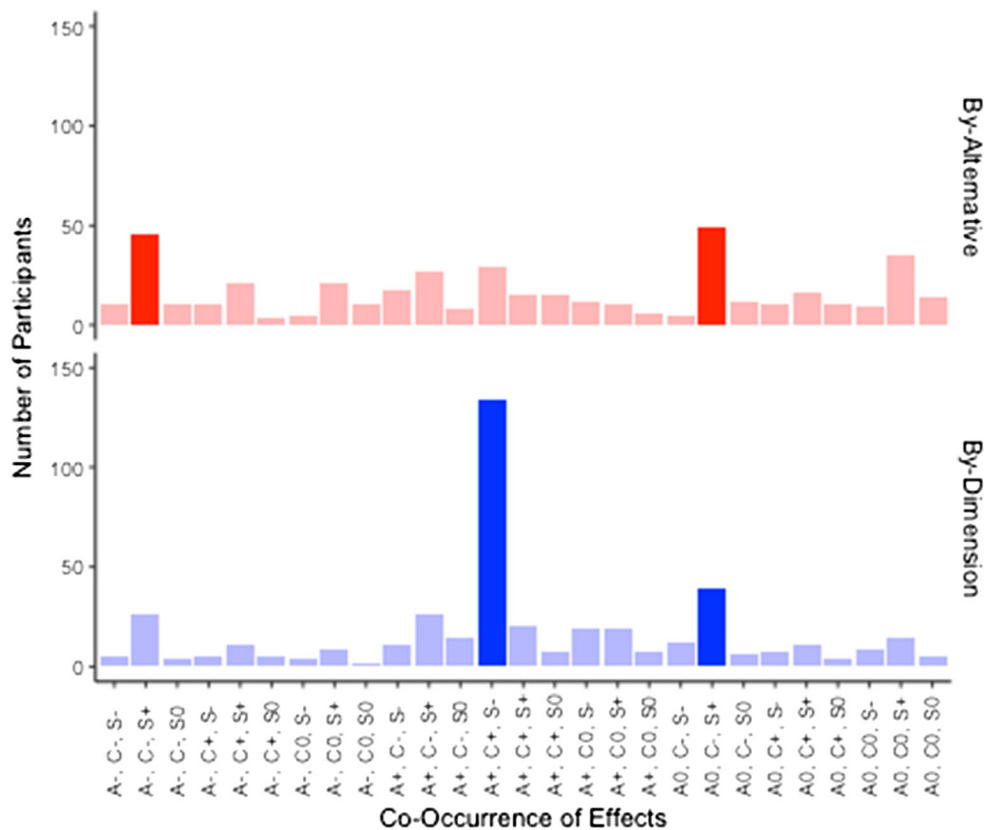


Fig. 3 Co-occurrence of reverse (-), null (0), and classic (+) attraction, compromise, and similarity effects within subjects, when choice information is grouped by alternatives (top) and by dimensions (bottom). Darker bars indicate the two most frequent categories within each format condition

Table 3 Posterior estimates of mean response times from the Bayesian model, separately broken down by target, expected value (EV), context, and presentation format conditions

Factor	Level	M	HDI Low	HDI High
Target	X	3.162	3.141	3.184
	Y	3.180	3.155	3.203
EV	2	3.227	3.203	3.251
	3	3.115	3.086	3.141
Context effect	A	3.167	3.143	3.194
	C	3.135	3.105	3.164
	S	3.212	3.183	3.240
Format	By-Alt	2.843	2.820	2.866
	By-Dim	3.499	3.470	3.528

Notes: A, C, and S are the attraction, compromise, and similarity effects, respectively

2. There is a marked effect of presentation format, such that responses are much slower in the by-dimension format. There is also an observable effect of context, such that response times are slowest for similarity choice sets. An individual-subject analysis of the response-time results is provided in the [Supplemental Material](#).

A hierarchical Bayesian regression model was used to test for differences in response times across target, EV, context, and presentation format conditions. Details of the model are provided in the [supplemental material](#). Inferences are again based on the 95% HDIs of a response time in a given condition. The estimated choice proportions and 95% HDIs for response times are provided in Table 3. The group differences described above are statistically supported. That is, the 95% HDI for mean response times is greater in the by-dimension condition than in the by-alternative condition, and greater for similarity choice sets than for the attraction and compromise choice sets.

Eye tracking: A re-analysis of Noguchi and Stewart (2014)

The previous analyses provide strong evidence that presentation format influences context effects. Although these differences imply a switch from a within-dimension to a within-alternative comparison process, the evidence is indirect because the comparison process was not directly measured. Here, we re-analyze the results of Noguchi and Stewart (2014) to provide this direct evidence.

Similar to the current experiment, participants in Noguchi and Stewart (2014) were asked to select one of three alternatives from a set designed to elicit an attraction, compromise, or similarity effect. Importantly, eye movements were tracked during the decision process. The authors found strong attraction and compromise effects and a weak similarity effect.

Furthermore, participants were biased towards making pairwise comparisons within a dimension; however, that bias was small, suggesting variability across trials.

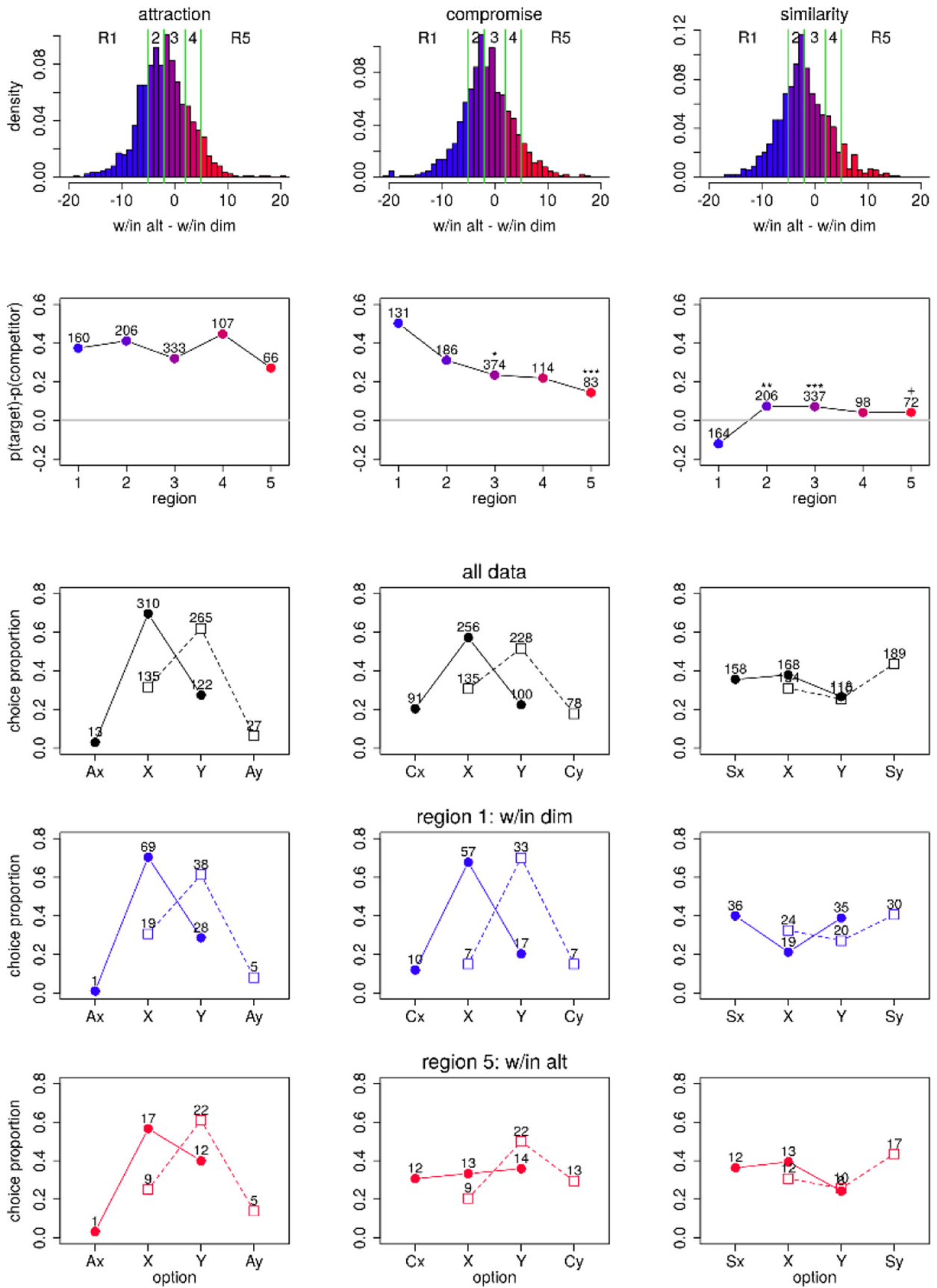
Our re-analysis partitions the trials by the relative number of within-dimension and within-alternative transitions. Additional details are included in the [Supplementary Materials](#). If the comparison process affects choice behavior as predicted, as the relative number of within-dimension transitions increases, the attraction and compromise effects should increase and the similarity effect should decrease. Conversely, as the relative number of within-alternative transitions increases, the similarity effect should increase and the attraction and compromise effects should decrease.

Consistent with the original analysis, there was a small bias towards within-dimension comparisons. The first row of Fig. 4 shows the distribution of within-alternative minus within-dimension transitions for all trials for each context. Positive and negative values correspond to trials including more within-alternative and within-dimension eye movements, respectively. For attraction, compromise, and similarity trials, there was an average of 1.40, 1.50, and 0.90 more within-dimension transitions.

These distributions were partitioned into five regions. Each region is associated with a color ranging from blue (Region 1) to red (Region 5). Region 1 includes trials strongly favoring within-dimension comparisons and Region 5 includes trials strongly favoring within-alternative comparisons. The region criteria (-5, -2, 2, 5) were fixed for all contexts and were selected to separate the distributions into qualitatively meaningful regions, be symmetric around 0, and keep enough data in each region for analysis. Different values were tried with similar qualitative results. Because we are interested in how the comparison process on a particular trial influences behavior, these analyses are at the trial level.

The second row of Fig. 4 shows how each context effect changes as the comparison process changes. The measure of interest is the relative proportion of target and competitor choices in each region. Positive values indicate a classic context effect and negative values indicate a reverse effect. Although the attraction effect is relatively unchanged, as predicted, the compromise effect decreases and the similarity effect increases, even reversing direction, as the proportion of within-alternative comparisons increases.

Fig. 4 Reanalysis of Noguchi and Stewart (2014). Top row: Distribution of within-alternative – within-dimension comparisons for each context effect broken into Regions 1–5. Second row: Proportion of target choices minus proportion of competitor choices within each region for each context effect; statistics (details are provided in the [supplemental material](#)) are a comparison to Region 1; + $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$. Bottom three rows: Choice proportions for all data and Regions 1 and 5 for the target, competitor, and decoy for each context effect. Numbers above points are sample sizes. Each region is associated with a color ranging from blue (Region 1) to red (Region 5)



The final three rows of Fig. 4 show the raw choice proportions for all data (compare to Fig. 5 from Noguchi & Stewart, 2014) and Regions 1 and 5 only. The black circles and white squares are trials on which A (X from Fig. 1) and B (Y from Fig. 1) are targets, respectively. An effect is supported if the black circle is above the white square for A and below the white square for B. Again, more within-alternative comparisons greatly weaken or reverse the compromise effect and more within-dimension comparisons reverse the similarity effect.

Discussion

The attraction, compromise, and similarity effects are critical phenomena in preferential choice that serve as key examples of how the decision process deviates from rationality (Huber et al., 1982; Simonson, 1989; Tversky, 1972). Several studies have found that the attraction and compromise effects tend to be positively correlated with each other but negatively correlated with the similarity effect (Berkowitsch et al., 2014; Liew et al., 2016; Trueblood et al., 2015). Work by Chang and Liu (2008) and Cataldo and Cohen (2018) suggest that a flexible comparison process may be a key mechanism underlying these correlations. Specifically, whereas the compromise effect is facilitated by a presentation format encouraging within-dimension comparisons and impeded by a format encouraging within-alternative comparisons (Chang & Liu, 2008), the opposite is found for the similarity effect (Cataldo & Cohen, 2018).

The present research extends previous work by jointly testing the influence of presentation format on the compromise, similarity, and attraction effects with an entirely within-subjects design. Previous work has only studied the similarity and compromise effects separately (Cataldo & Cohen, 2018; Chang & Liu, 2008), and the attraction effect has not been tested at all in this paradigm. As predicted, a by-alternative presentation format elicited the standard similarity effect, but weak and reversed attraction and compromise effects, respectively, whereas a by-dimension presentation format produced standard attraction and compromise effects but a reverse similarity effect. These results not only replicate effects found in past work but demonstrate their relationship at the subject level.

The current data also allow for the incorporation of response-time analyses, which have rarely been considered in context effects and never in this framework. Interestingly, longer response times were produced in the by-dimension condition and the similarity choice sets. The effect of format likely results from a difference in the number of within-alternative and within-dimension comparisons. Though not directly assessed in the current data, a re-analysis of eye-tracking data collected by Noguchi and Stewart (2014) supports this interpretation. In their study, the similarity effect increased and the compromise effect decreased as the

proportion of within-alternative transitions increased. The lack of a significant decrease for the attraction effect differs from the present work, although we note it is historically a very robust effect (e.g., Berkowitsch et al., 2014).

The increased response times for similarity choice sets supports the idea that a different process is associated with this effect. Indeed, models of preferential choice accounting for all three effects often assume that the similarity effect is generated by a distinct mechanism (Bhatia, 2013; Noguchi & Stewart, 2018; Roe et al., 2001; Trueblood et al., 2014; Usher & McClelland, 2004; Wollschläger & Diederich, 2012). The data suggest that this assumption is appropriate. Although speculative, it is even possible that a deliberative process underlies the attraction and compromise effects, whereas a more heuristic process underlies the similarity effect. In the present data, although similarity *choice sets* are associated with increased response times, a by-alternative format promoting the similarity effect is associated with reduced response times. This idea is consistent with previous work finding that while the similarity effect can be accounted for by a heuristic model (Tversky, 1972), the attraction and compromise effects are inhibited by the use of a lexicographic heuristic (Simonson, 1989). Further research directly testing this account is needed.

Previous researchers have noted that models of preferential choice can account for the correlation between context effects seen both here and in prior work (Berkowitsch et al., 2014; Liew et al., 2016). For example, Roe et al. (2001) state that Multi-alternative Decision Field Theory (MDFT) predicts a negative correlation between the attraction and similarity effects, but a positive correlation between the attraction and compromise effects. With few exceptions, such modeling work has almost exclusively considered the presence or absence of context effects (e.g., Trueblood et al., 2015), but not whether they can be reversed. Consistent with the current results, however, Cataldo and Cohen (2018) showed that variations of both the MDFT and Multi-attribute Linear Ballistic Accumulator (MLBA; Trueblood et al., 2014) predict that a reverse similarity effect is more likely than a standard similarity effect when the attraction and compromise effects are present. To account for the reverse similarity effect, the MDFT relies on increased forgetting and increased inhibition between alternatives and the MLBA relies on increased attention to negative differences of attributes. Although the models can potentially predict the present results, more work is needed to determine whether the mechanisms used to do so are psychologically supported. The current research suggests a potential alternative account in which these effects are driven, in part, by changes in the comparison process.³ More broadly, it is important for models of preferential choice to take the

³ A step in that direction is provided by the Associations and Accumulation Model (Bhatia, 2013), which assumes that attention to attributes varies based on the available alternatives.

pattern of reversals of and correlations between context effects more seriously, and allowing for diverse comparison styles may be an effective approach to doing so.

This research provides strong evidence that the comparison process should be treated with more nuance in theories of preferential choice. Determining relative values is intuitively an important mechanism underlying context effects, but evidence suggests that this mechanism may not occur strictly via within-dimension comparisons. Differential patterns of context effects are produced by modulating the ability to compare choice information within alternatives or within dimensions. The theoretical implication from these data is that the comparison process may serve to promote context-dependent choice as well as the apparent diversity within it. From a practical standpoint, the data suggest that requiring models to simultaneously account for all three effects is an unrealistic and overly simplified constraint.

Author Note Both authors contributed to all aspects of this work. The data have been made publically available at: <https://osf.io/736db/>. The authors are very grateful to Drs. Noguchi and Stewart for making the data from Noguchi and Stewart (2014) available.

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