Title

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Author

Karmarkar, Uma R

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The Impact of 'Display-Set' Options on Decision-Making

Uma R. Karmarkar

Harvard Business School
Morgan Hall, 183
Soldiers Field Park
Boston, MA 02163
ukarmarkar@hbs.edu
Ph : 617-495-6033

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The way a choice set is constructed can have a significant influence on how individuals perceive and evaluate their options, and make decisions between them. Here, I examine whether a "display set" of visible but unavailable options can exert these same types of influences on whether or not to choose a single (target) item. Across a series of experiments, purchase intent is increased when the display set and target are drawn from the same category, but decreased when the display and target items are mismatched. This effect is shown to depend on perceived similarity, such that increasing display-target similarity increases purchase intent towards the target. Furthermore, contrary to the predictions made by previous neural and behavioral research on choice sets, the relative value and/or number of display-only items have no significant impact on these decisions. These findings reveal a novel choice behavior in commonly encountered settings such as online marketplaces.

Imagine shopping for a pair of headphones online. On the website's page for a particular pair, you might see a photo of the headphones, their price, and of course a button letting you choose whether or not to make a purchase. Many websites will also show you photos of other headphones they offer on the same page. Or you may see items from other categories that the store is trying to promote. Do these "display items" make you more or less likely to decide to buy?

It's well established that the composition, or architecture, of a choice set can influence decision outcomes (Huber, Payne, and Puto 1982; Tversky and Simonson, 1993; Bettman, Luce and Payne, 1998; Iyengar and Lepper 2000, etc.). In particular, the addition of various types of options can cause people to shift their relative preferences, switch their choices, or even avoid making a decision altogether. In these situations, the decision-makers are generally being asked to select one or more options from a number of available alternatives. However, when the actionable choice set is held to a single target item, it is unclear whether the composition of a "display-only" set might be similarly influential.

Previous research has examined reactions to "phantom alternatives," defined as attractive choice options that are presented to an individual despite being currently unavailable (Pratkanis and Farquhar, 1992). Phantoms do create a range of choice biases (e.g. Farquhar and Pratkanis, 1993, Scarpi and Pizzi 2013) and can exert influences similar to "real" choice options even when people are explicitly informed that the phantoms are unavailable (e.g. Doyle et al. 1999, Trueblood and Pettibone 2015). More broadly, a number of recent studies in decision neuroscience have demonstrated that the brain encodes choice-relevant preferences even when participants are unconcerned with,

or unaware of, any need to make a decision (Lebreton et al. 2009; Tusche, Bode, and Haynes, 2010; Levy et al. 2011; Smith et al. 2014). These findings suggest that people will still attend to the value of display items, even if those items are not considered to be part of the choice. Overall, then, it seems plausible that the mere presence of display-only options should have an impact on choice. But if so, how? Would display items have the same influence as regular choice options, or might they exert different effects?

If it can be assumed that display items will be treated as viable decision alternatives, then strong predictions emerge from research on multi-option choice sets. First, the relative value of the display items compared to the target would be expected to significantly influence purchase rates (Tversky 1972; Huber, Payne, and Puto 1982; Simonson 1989; Tversky and Simonson 1993; Louie et al. 2013). For example, lower value display items might increase purchases by making the target appear more attractive in comparison (Huber, Payne and Puto, 1982) while high value alternatives might decrease choice of the target option (Louie et al. 2013). A second prediction is that increasing the number of display items might increase the difficulty of the choice, or anxiety associated with it, and thus decrease target purchase rates (Iyengar and Lepper, 2000[1]; Schwartz 2004; Shenhav and Buckner, 2014), assuming that the decision-maker is building their preferences based on what they encounter in the store (e.g. Chernev 2003).

A different set of predictions arise if we consider the possibility that display sets and choice sets have different properties, and that display sets may be influential in framing the decision or engaging a particular type of decision process. In this case, the perceived overall cohesion of the display and target information could determine its

[1] Note that recent examinations of choice set size suggest that there are likely to be several boundary conditions on the scope of this prediction (e.g. Scheibehenne et al. 2010)

impact on choice. Categorization is an important element of the decision-making process, and grouping items into a category can allow people to make judgments about spending or resource allocation more generally (e.g. Henderson and Peterson 1992; Ulkümen, Chakravarti, and Morwitz 2010). With this in mind, display items that "match" the target could increase purchase intent by reinforcing the target's category as the frame for the choice. In addition, when items are presented as part of a set that "fits", the set is seen to be more attractive or valuable as a whole, and of more interest than the same item offered with "mismatched" options (Evers, Enbar and Zeelenburg, 2014). Thus presenting a cohesive display, in which all elements are perceived to be in the same category, might enhance the attractiveness of the target item. Conversely if the display-only items represent categories that differ from the target item, they may reduce the attractiveness of the display, "distract" individuals from the target, and/or raise awareness of opportunity costs, decreasing purchase intent (Frederick et al. 2009; Spiller 2011).

Across six experiments, I show that display sets influence choice in a manner consistent with providing a decision frame (or reinforcement of the decision target's category) and distinct from the predictions from choice set experiments. Study 1 reveals that choice is increased when the category of the display items and target item match, but decreased by target-display mismatches. This is replicated with incentive compatible choices in Study 2. Studies 3 and 4 provide additional demonstrations of this effect, and also show that the relative value of individual display items and the size of the display set have no significant impact on these decisions. Finally, Study 5A and 5B explore whether the effects of the display context are due to a discrete (mis)match in congruence with the

target, and finds they can be better understood as a continuous function of relative similarity across all of the information viewed by the decision-maker.

STUDY 1

Materials and Methods

Two hundred and twenty-eight participants (M_{Age}=32.5, 80 F) completed this study online from a national pool via Amazon's Mechanical Turk (AMT) and participated for monetary compensation. Two participants were excluded based on failing the instruction comprehension check as described below, and one participant was excluded based on data logging errors. Participants were randomly assigned to one of three experimental conditions (Figure 1). In the Alone condition, participants viewed target items by themselves. In the Matched condition, participants viewed the targets together with two display items from the same retail product category. So, for example, a target board game was shown with two display board games. In the Mismatched condition, participants viewed the targets with two display items selected from different categories.

After consenting to participate, participants viewed the task instructions and a sample choice. They were asked to indicate their comprehension by typing in the phrase "I Understand." In the Matched and Mismatched conditions, participants were informed they would be choosing only whether or not to purchase the outlined and captioned target item in the center of the screen. Target captions included price information, taken from the price of the item in online retail channels at the time the study was conducted.

Participants were also given an opportunity to report any issues or confusion with the task after their completion of the survey.

All participants made decisions about four target items (see *Supplemental Material 1* for additional information). In each of these decisions, participants viewed the target and display items on the screen. After 4 seconds, a 6-point rating scale labeled [Strong No, No, Weak No, Weak Yes, Yes, Strong Yes] also appeared for them to rate their purchase intent. Participants were free to make the decision itself at their own pace. Since the scale lacked a midpoint, it required participants to make a definitive choice (yes or no), but also allowed them to express relative levels of commitment. After their decisions, participants rated their liking on a scale from 1 = Do Not Like to 7 = Like Very Much and willingness to pay (WTP) in dollars and cents for all of the items viewed. They completed the survey by listing basic demographic information (e.g. age and gender; see *Supplemental Material 2* for the experimental survey materials).

Results

The influence of display set composition on purchase intent was tested using a 3 (Alone, Matched, Mismatched) x 4 (target item) repeated measures analysis of variance (ANOVA). As shown in Figure 2A, significant differences in purchase intent were found between the display conditions ($F(2,222)=4.49$, $p=.012$, $\eta_p^2=.039$). Pairwise comparisons within this model showed that average purchase intent when the display items were Matched ($M=3.13$, $SD=.88$, 95% CI [2.95 3.32]) was significantly higher than that for Mismatched products ($M=2.72$, $SD=.81$, 95% CI [2.54 2.92]; $p<.005$). Purchase intent in the Alone condition ($M=2.93$, $SD=.82$, 95% CI [2.74 3.12]) was not significantly

different from either of the display conditions (Alone/Matched, p=.140; Alone/Mismatched, p=.135). There was no significant interaction of condition and the specific target items (F(6,666)=.601, p=.730) indicating that the effects of the displays were consistent across all four targets/choices. Across the four target products there was no main effect of display type on liking ratings (F(2,222)=1.732, p=.179), or on WTP (F(2,221)=1.279, p=.280).[2]

The design of this study makes it possible to test whether the relative preferences for the display-only items influence purchase intent for the target item, as might be expected if the display items were perceived as true choice alternatives. This was explored with a mixed-effects regression model on only the data from the Matched and Mismatched conditions with four observations for each participant. Purchase intent was regressed on the average liking ratings for the two non-target items, on the category of the non-target items (Matched or Mismatched), and on the interaction of those two factors in a mixed-effects regression model. The overall model was significant (Wald X^2=24.99; p<.001), as was the coefficient on liking for the display items (*b*=.185, SE =.062, p<.005), such that higher liking for the neighbors correlated with higher likelihood of purchase. In this model, the main effect of display-target congruence was marginal (*b*=.616, SE =.324, p=.058) though positive. The effects of display similarity and preference for the non-target items did not interact.

These findings demonstrate that a decision about a single item can be influenced by the mere presence of other displayed items, even when switching is prevented. In particular, choosing from a cohesive display makes purchase more likely than choosing

[2] WTP data from one participant was uninterpretable

from a mismatched display. This finding was replicated in a study controlling for the attributes of the specific display items (see *Supplemental Material 3*). In addition, the results suggest that increasing the value of the display items might not decrease choice, as predicted by value normalization models (e.g. Louie et al. 2013), but could even increase it. Such outcomes are less consistent with the display set acting as a set of competing alternatives for the target. Instead, they offer evidence that the display set may signal a general frame for the decision, enhancing consideration of the target by reinforcing the target category.

To examine the robustness of this effect, the next study tested the effects of matched versus mismatched displays in incentive compatible decisions.

STUDY 2

Materials and Methods

Eighty-three participants under the age of 40 (M_{Age}=23.98, 55 F) completed this study in person for monetary compensation. Similar to Study 1, participants were randomly assigned to the Matched condition, in which the target and display items were chosen from the same retail category, or the Mismatched condition in which target and display were from different categories.

Participants were endowed with $10 independently of their main study compensation. They were instructed that one of their purchase decisions would be selected at random to count "for real" and that the money could be used to buy a product that they would actually receive. All products were priced at less than the endowment,

and less than their true retail price (discounted by >40%). Participants were informed that products were discounted, but were not given the specific percentage of the discount. Participants received following general task instructions: "You will only be making a decision about whether or not to buy the named product in the center at the listed price." They were shown the six-point purchase intent scale (as in Study 1) and informed that "[a]ny 'No' answer will mean you will NOT receive the product if the decision is chosen to count for real. Similarly, any 'Yes' answer will count as buying the product." The experimenter verbally confirmed that answering Weak Yes, Yes, or Strong Yes (4,5, or 6) committed the participant to buying the item. Participants indicated their comprehension of the task and the incentive compatibility element by typing in the phrase "I Understand," and were encouraged to ask the experimenter for clarification if needed.

All participants made decisions about two target items (see *Supplemental Material 1* for additional information). In each of these decisions, they viewed a screen with target and display information for four seconds. The stimulus layout was similar to that in Study 1, but did not include the dark outline around the target item. The six point scale (1 = Strong No to 6 = Strong Yes) then was added to the screen, and participants rated their purchase intent at their own pace.

After their decisions, participants rated their liking and willingness to pay (WTP) for the individual items. They were also asked to indicate how much they liked each *set* of items (display and target)[3]. They completed the survey by listing basic demographic information (e.g. age and gender.)

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[3] A software error resulted in missing values for several participants' set similarity ratings; as a result the incomplete data for this measure is not analyzed here.

Results

The influence of Matched versus Mismatched display composition on purchase intent was tested in an ANOVA with repeated measures across responses for the two target products. As illustrated in Figure 2B, average purchase intent when the display items were Matched (M=2.86, SD=1.01, 95% CI [2.54 3.18]) was significantly higher than that for Mismatched products (M=2.37, SD=1.07, 95% CI [2.04 2.69]; F(1,81)=4.63, p=.034, η_p^2=.054). There was no significant interaction of condition and the specific target items (F(1,81)=1.205, p=.276) indicating that the effects of the displays were consistent across the two choices. A similar ANOVA across the target products showed a main effect of display type on liking ratings such that liking was higher in the Matched condition (M=3.88, SD=1.33, 95% CI [3.46 4.30]) compared to the Mismatched condition (M= 3.26, SD=1.42, 95% CI [2.83 3.69]; F(1,81)=4.262, p=.042, η_p^2=.050). There was no impact of display type on WTP (F(1,81)=.848, p=.360).

Participants also indicated their perceptions of each full set of items seen (e.g. target and display items together as shown during the decision). Comparing conditions in an ANOVA showed that liking was higher for the matched sets (M=4.11, SD=1.26, 95% CI [3.72 4.49]) than for the mismatched sets (M = 3.23, SD=1.23, 95% CI [2.84 3.62]; F(1,81)=10.156, p<.005, η_p^2=.111). This finding is consistent with the possibility that the attractiveness of a matched set increases the likelihood of purchase, though it is important to note that this measure is, by definition, highly correlated with liking for the target.

STUDY 3

A central concept in judgment and decision-making literature is that the relative value of options in a choice set can significantly influence how people make decisions. While the first two studies offered some preliminary insight into how the attractiveness of the display might relate to choice, it is difficult to infer causality from those measures. This study was designed to manipulate the relative value of the display-only items compared to the decision target, allowing a direct measure of this potential moderator, and a direct test of whether the composition of display sets exert the same influence on decision-making as the composition of choice sets do.

Materials and Methods

Three hundred and forty-one participants (M_{Age}=33.15, 140 F) completed these measures through AMT, and were randomly assigned to one of four experimental conditions. (One participant was excluded based on failing the comprehension check as described in Study 1.) These were based on a 2x2 between subject design that varied the categories of the display options (Matched vs. Mismatched) and their value (High vs. Low).

The target choice item was a particular type of breakfast cereal. Participants in pre-tests using independent AMT samples had rated how much they liked several products including various cereals in one survey (N = 120, M_{Age}=33.8, 53 F) and snack chips in another (N = 119, M_{Age}=33.17, 44 F) on a scale of 1 = Not at All to 7 = Very

Much. Based on these ratings, two low value products and two high value products from the Matched (cereal) and Mismatched (snack chips) categories were selected.

Participants underwent a procedure nearly identical to Study 1. All participants saw the target item as part of a three-item display and indicated their purchase intent, liking and WTP for that item. Following this, participants rated their liking for a number of different products, including the display-only items in that choice, and reported demographic information.

Results

As a manipulation check, the perceived value of the display items was compared across the four conditions in a 2 (Matched vs. Mismatched) x2 (High vs. Low) ANOVA with repeated measures across the two display items. Both items in the high value conditions were liked significantly more than items in the low value conditions ($F(1,336)=93.85$, $p<.001$, $\eta_p^2=.218$; Figure 3A). In addition, there was no significant difference in the average liking ratings for cereals (Matched) versus snack chips (Mismatched; $F(1,336)=2.004$, $p=.158$), nor was there a significant interaction between display item category and display item value ($F(1,336)= 1.526$, $p=.218$).

Comparing purchase intentions for the single target item based on display type in a 2 (Matched vs. Mismatched) x 2 (High vs. Low) ANOVA shows the same effect of display congruence as the first two studies (Figure 3B). Specifically, purchase intent was higher in the Matched ($M=3.57$, $SD=1.58$, 95% CI [3.33 3.80]) compared to the Mismatched condition ($M=3.14$, $SD=1.54$, 95% CI [2.904 3.38]; $F(1,336)=6.441$, $p=.012$, $\eta_p^2 =.019$). However, there was no main effect of High compared to Low value display

items (F(1,366)=.687, p=.408) nor was there a significant interaction of display value and display similarity on target purchase likelihood (F(1,366)=.900, p=.343).

In this experiment, testing the liking ratings for the target via ANOVA reflected a similar main effect of a Matched display (M=4.45, SD=2.09, 95% CI [4.14 4.76]) compared to a Mismatched one (M=3.83, SD=1.94, 95% CI [3.52 4.13]; F(1,336)= 7.930, p<.01, η_p^2=.023). While there was no main effect of display item value on target liking (F(1,336)=.012, p=.914), there was a trend towards an interaction with the similarity conditions (F(1,336)=3.063, p=.081, η_p^2=.009). In particular, the benefit of a matched display appeared to be marginally weaker when the display items had low value compared to high value (see *Supplemental Material 4*). There were no significant differences of either display category or display item value on WTP for the target item.

This study reinforces the importance of display-target congruence but shows that the relative value of the display as compared to the target does not significantly influence choice. Such findings arguing against the possibility that the display items might be perceived as superior phantom or inferior unavailable-but-viable decoy alternatives.

STUDY 4

In the first three experiments, participants only saw two display items together with the target. If the display set was being processed as viable choice alternatives, it is possible that increasing the *number* of options might influence the likelihood of purchasing the target or the difficulty of making a decision. The degree to which the observed congruence effects generalize (or hold) beyond a two-item display is tested in

the following experiment.

Materials and Methods

Three hundred and forty-one individuals (M_{Age}=34.6, 167 F) completed this study online via AMT. They were randomly assigned to one of four experimental conditions arising from a 2x2 between-subject design that varied the category of the display options (Matched vs. Mismatched) and the total number of display-only options (2 vs. 6).

In a procedure similar to Studies 1 and 2, participants indicated their purchase intent towards two target products (a board game, and a DVD of a season of a popular television series) in displays defined by the four conditions. Given that larger set sizes might influence a choice by increasing its perceived difficulty, participants indicated their confidence in their choice, and their sureness that they made the best decision on a scale of 1 = Not At All to 7 = Very Much. They also reported how similar they perceived the display and target items to be on a scale from 1 = Not At All Similar to 7 = Highly Similar, and rated liking and WTP for all of the items viewed.

Results

To determine whether the larger number of items might impact perceptions of categorical fit, perceived similarity of the items was compared using a mixed model ANOVA with repeated measures across responses for the two decisions. As expected, there was a between-subject main effect such that the Matched conditions (M=4.83, SD=1.84, 95% CI [4.63 5.02]) were rated as more similar than the Mismatched conditions (M=1.63, SD=1.16, 95% CI [1.44 1.84]; $F(1, 337)=508.026$, $p<.001$,

η_p^2=.601). In addition, the six-item displays (M=3.45, SD=2.29, 95% CI [3.29 3.68]) were generally perceived to be more similar than the two-item displays (M=2.97, SD=2.14, 95% CI [2.78 3.18]; F(1,337)=12.764, p<.001, η_p^2=.036). There was no significant interaction between display size and category (F(1,337)=1.489, p=.223).

The effects of the display types on purchase intent for the target item were also examined using a mixed model ANOVA with repeated measures across the two decisions (Figure 4). As expected, there was a significant main effect of display congruence, such that average purchase intent in the Matched groups (M=3.18, SD=1.20, 95% CI [3.00 3.35]) was higher than that in the Mismatched groups (M=2.84, SD= 1.10, 95% CI [2.66 3.01]; F(1,337)=7.190, p<.01, η_p^2=.021). However, there was no significant effect of increasing the display set size (F(1,337)=2.392, p=.123), nor was there an interaction between congruence and set size (F(1,337)=.002, p=.962).

A mixed model ANOVA with repeated measures across targets revealed that liking for the target was marginally higher in the Matched condition (M=4.26, SD=1.44, 95% CI [4.05 4.47]) than in the Mismatched one (M=3.98, SD=1.30, 95% CI [3.77 4.20]; F(1,337)=3.311, p=.070, η_p^2=.010). In addition, liking was marginally higher for targets presented in a six-item display (M=4.25, SD=1.41, 95% CI [4.04 4.47]) compared to a two-item display (M=3.99, SD=1.40, 95% CI [3.78 4.20]; F(1,337)=3.043, p=.082, η_p^2=.009). There was no interaction effect (F(1,337)=1.261, p>.262). There were no significant effects of category or set size on WTP for the target.

Responses to the decision certainty questions were tightly correlated in the board game decision (r=.794, p<.001) and in the DVD decision (r=.878, p<.001) across all the experimental conditions. As a result these were averaged into a single outcome for each

decision. A mixed model ANOVA with repeated measures across the target decisions revealed no effect of display set congruence ($F(1,337)=.940$, $p=.333$), and no significant effect of set size ($F(1,337)=2.042$, $p=.154$) on this decision certainty value.

As a whole, this experiment again finds that the primary influence of a display set on choice arises from whether it provides a context that is congruent with the target decision, and that this holds when the display set size is varied.

STUDY 5A

While the relationship of the display items to the target has been operationalized as a binary construct (Matched or Mismatched) in the first four studies, it is also possible that the relative strength of the effect might scale continuously depending on relative perceptions of similarity across the items presented. Study 4 provides initial evidence supporting this; a mixed effects regression of target purchase intent dependent on the 7-point perceived similarity rating for the display (controlling for subject random effects across the two decisions) yields a significant positive relationship ($b=.118$, $SE=.027$, $p<.001$) accounting for a significant amount of the variance in the data (Wald $X^2=18.92$; $p<.001$). I test the potential causal role of similarity directly in the following experiment.

Materials and Methods

Two hundred and fifty-five participants ($M_{Age}=32.07$, 101 F) completed this study online via AMT. All participants made a single decision about purchasing a computer mouse, and were randomly assigned across three ascending levels of display-target

similarity. This corresponded to a computer mouse being displayed with a watch and bath towels (Low), with other types of computer peripherals made by the same manufacturer (Moderate) and with other computer mice (High).

In a procedure similar to the earlier studies, participants in all three conditions made a single decision about purchasing the target item, and rated liking for the target. As in Study 4, participants answered two questions regarding their decision confidence; answers to these were highly correlated ($r = .823$, $p<.001$), and are reported as a single composite measure. In addition, participants indicated perceived similarity of the set of items presented by moving a slider from 0 = Not at all Similar to 100 = Very Similar.

Results

Regressing purchase intent directly on the perceived similarity ratings (on a 100 point scale) demonstrated a relationship between these two factors (b=.006, SE=.002, $t(249)=2.38$, $p=.018$)[4] that explained a significant amount of the variance ($R^2 = .022$, $F(1, 249) = 5.65$, $p=.018$). A more conservative analysis can be done using the manipulated levels of similarity perceived across the displays. Using an ANOVA to compare the perceived similarity ratings across categories confirms that the three levels of similarity were indeed seen as distinctly different ($F(2,248) = 275.1$, $p<.001$, η_p^2=.689) and monotonically increasing from Low (M=6.31, SD=18.13, 95% CI [2.02 10.60]) to Moderate (M=53.10, SD=26.15, 95% CI [48.82 57.36]) to High (M=77.25, SD=18.127, 95% CI [72.98 81.52]).

[4] Data from four of the participants was missing for this question.

Based on this, similarity could be coded as a linear parametric variable with three levels corresponding to Low (1), Moderate (2), and High (3). Regressing purchase intent on this factor revealed the predicted significant relationship between increases in similarity and increases in purchase intent (*b*=.206, SE=.104, t(252)=1.98, p=.049), convergent with the findings of Study 4. Overall, this explained a modest but significant proportion of variance in purchase intent (R^2 = .015, F(1, 253) = 3.93, p=.049). Regressions measuring the effects of similarity level on target liking and decision confidence ratings did not yield significant coefficients.

STUDY 5B

To better support the relationship between relative set similarity and likelihood of purchase, this study offers a replication of the effects in Study 5A.

Materials and Methods

Four hundred and fifty-two participants (M_{Age}=33.79, 199 F) completed this study online via AMT. All participants made a single decision about purchasing a set of bath towels, and were randomly assigned across three ascending levels of display-target similarity. This corresponded to the towels being displayed with a watch and computer mouse (Low), with other bathroom accessories (Moderate) and with other towels (High).

Procedures were identical to Study 5A, with participants indicating their purchase intent, decision confidence, perceived similarity of the target-display set, and liking for the target. Responses to the decision confidence questions were highly correlated (r=.820, p<.001), and are reported as a single composite measure.

Results

Regressing purchase intent on similarity (on a 100 point scale) demonstrated a significant positive relationship such that increasing similarity corresponded to increasing purchase intent (b=.005, SE=.002, t(450)=2.68, p<.01) with a model accounting for a significant amount of the variance (R^2=.016, F(1, 450) =7.386, p<.01). As in Study 5A, comparing similarity ratings across the three conditions by ANOVA confirmed that on average they corresponded to distinctly perceived levels of similarity (F(2,449) = 165.25, p<.001, η_p^2=.424) and that those levels increased monotonically from Low (M=15.43, SD=23.7, 95% CI [11.57 19.29]) to Moderate (M=50.19, SD=25.07, 95% CI [46.31 54.08]) to High (M=64.69, SD=23.83, 95% CI [60.80 68.57]).

Purchase intent was thus regressed on similarity coded as a parametric regressor with levels for Low (1), Moderate (2) and High (3). The predicted significant relationship between increases in similarity and increases in purchase intent was again observed (b=.163, SE=.079, t(450)=2.077, p=.038). This explained a small but significant proportion of variance in purchase intent (R^2=.009, F(1, 450) = 4.32, p=.038). In this study, a simple linear regression also showed that increasing similarity (coded parametrically) increased liking for the target (b=.343, SE=.093, t(448)=3.677, p<.001). No such relationship was seen between condition and decision confidence ratings.

GENERAL DISCUSSION

Across six experiments, I show that the mere presence of “display-only" options can increase or decrease purchase intent for a target item under consideration (see Supplemental Materials 1 for a summary; Supplemental Materials 3 for a seventh replication study). The direction of the effect depends on the composition of the display set, such that increasing the display-target similarity increases choice likelihood.

It seems plausible that people might engage in the same kinds of decision processes regardless of whether they are interacting with viable choice options or options that are only for display. However, the findings here provide little evidence for the kind of effects that might be predicted by prior research on multi-item choice sets. For example, Study 3 demonstrates that the relative value of the display items compared to the value of the target item has no causal effect on purchase intent for the target, despite contrary predictions from the behavioral and neuroscience literature (e.g. Tversky 1972; Huber, Payne, and Puto 1982; Simonson 1989; Tversky and Simonson 1993; Farquhar and Pratkanis 1993; Scarpi and Pizzi 2013; Louie et al. 2013).

Study 4 tested whether the effects might be dependent on the use of only two display items, and explored the possibility that increasing that number might impact choice, or moderate the similarity effects. In everyday marketplace situations where people encounter these types of choices, the scope of a display can be quite extensive, and can vary significantly. Focusing on decision-makers that build their preferences based on the available assortments (e.g. Chernev 2003), if display items were perceived as choice alternatives, more items could create more anxiety and/or increase choice

avoidance (Iyengar and Lepper, 2000; Schwartz, 2004; Shenhav and Buckner, 2014). In contrast, if the display items were processed as category reference or decision frame, increasing the number of items in a display might increase the overall attractiveness of that context (Oppewal & Koelemeijer, 2005; Iyengar and Lepper, 2000), and thereby increase purchase. There was weak evidence for the latter - in these studies, the larger sets of display options had a modest, but not statistically significant, benefit on liking for the display item. In addition, there was no significant effect on purchase, suggesting that the influence of display set size is not as strong as the primary influence of display-target matching. However, it may be useful to extend these studies to more extreme numbers (e.g. 10+ items). Future research on much larger set sizes could also address the possible impact of increased cognitive load, working memory limitations, and competition for visual attention for these findings.

As alluded to, the value and number of display set items appeared to have a marginal effect on how much people liked the target, though purchase intent and perceived monetary value (WTP) were largely unaffected. One possible explanation for this is that expressions of preference have no implied commitment, and thus may be more malleable than purchase decisions or WTP, which require consideration, or realization, of costs. An important question to consider going forward is whether there are specific goals or motivations that would amplify the effect of these factors on both preference and behavioral outcomes, such as when the decision-maker enters a choice looking for bargains or with other price-based motivations.

Relatedly, one potential limitation of the studies here is that to better establish whether the “mere presence” of display options might be sufficient to influence choice,

the prices of those options were not included. fMRI research has shown that individuals code their preferences for items in their environments even when they are in non-choice situations (Lebreton et al. 2009; Tusche, Bode, and Haynes, 2010; Levy et al. 2011; Smith et al. 2014), suggesting that the display options would still be considered and assigned a value in the absence of price information. Indeed, in many choice settings where price tags are less salient than the products, discovering the prices of nearby items requires not only attention, but also active visual search. However, extending this work to a field experiment that included a range of buyer motivations and more complete pricing information in a marketplace context would be a meaningful next step in understanding the scope of these effects.

Given the central role of similarity in these findings, particularly Study 5A and 5B, one possible underlying mechanism is that the benefits of matched displays may reflect the same desire for consistency observed in the "set-fit" effect (Evers et al. 2014). Those authors found that individuals show a strong preference for sets where all the items were perceived to fit together. Notably this sense of fit arose from the set being governed by a simple rule such as all of the items being of the same type, or all being different along a specific or recognizable dimension. One example might be four pens of the same general appearance, but all different colors. In this research, Study 2 showed that matched target and display stimuli were indeed perceived to be more attractive as a whole than mismatched groupings, consistent with this idea. Furthermore, while some of the mismatched displays were "all different", those differences appeared random (e.g. a display set consisting of a watch and a set of towels), and could not be described by a

straightforward rule, supporting the idea that purchase intent towards the target is at least partly driven by the perceived consistency of the overall choice context.

The perception of opportunity costs offers another possible mechanism related more to the negative impact of mismatches than the positive impact of matches. On the surface, adding any competing options to a target item might be expected to raise concerns about opportunity costs. However, if the display is considered to frame the decision, then a matched-category display is likely to reinforce and/or support the choice of the target by supporting the idea of choosing something in the target's category. In contrast, mismatched displays might decrease purchase by reminding individuals of a broader range of interests, goals, and/or uses for their money (Frederick et al. 2009, Spiller 2011). Thus beyond influencing preferences for the target item, mismatched displays might decrease purchase by reducing preferences for the target category.

More generally, the expression of these effects is likely to be dependent on an individual's decision process and the scope of the choice. For example, eyetracking research suggests that the likelihood of selecting an item can be critically influenced by the amount of visual attention it receives (e.g. Milosavljevic et al. 2012, Krajbich et al. 2010). In the studies reported here, participants needed to wait a few seconds prior to indicating their purchase intent, encouraging them to attend to all of the stimuli. However, it remains unknown whether participants looked carefully at the display items, or whether attention to the target and/or display items might have varied depending on the degree of similarity. Situations that involve explicitly ranking or otherwise evaluating of the display options could also disrupt the effects seen here by increasing visual attention across the items, and increasing the likelihood that the display items were

considered as viable choice options. Additionally, it is unclear whether display options might be treated more like choice options in decisions that involve selecting multiple items as opposed to only one target. The range of choice structures possible thus offers several interesting directions for extending this work and understanding whether and how the benefits of similarity for purchase intent might generalize.

There is further potential in considering how these findings relate to the categorization and physical location of products "in-store". The relative position of products on a store shelf has a significant impact on product perceptions and consumer decisions (e.g. Dreze et al. 1994, Pizzi and Scarpi 2016), suggesting that the spatial configuration of the display and target items might moderate these effects. Indeed, items that are physically closer to each other can be perceived to be more similar (e.g. Casasanto 2008, Boot and Pecher 2010, Lakens et al. 2011). Grouping display and target products by their common benefits (as opposed to common attributes) may also increase perceived similarity across a set of items from the same overall product category by shifting people into more abstract construal levels (Lamberton and Diehl, 2013). Thus the benefits of increased display-target similarity on purchase intent could potentially be amplified by the physical proximity of the items as well as the criteria by which the "matched" display is designed.

To summarize, these findings reveal a novel choice behavior and demonstrate its robustness across varying types of items (e.g. foodstuffs, leisure-related products, utilitarian items) in situations involving one or more decisions. As a whole, this research offers a strong platform on which to build a better understanding of the influences of display sets, and how they may differ from the influences of choice set options.

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Figure Legends

Figure 1: Study 1 Stimuli

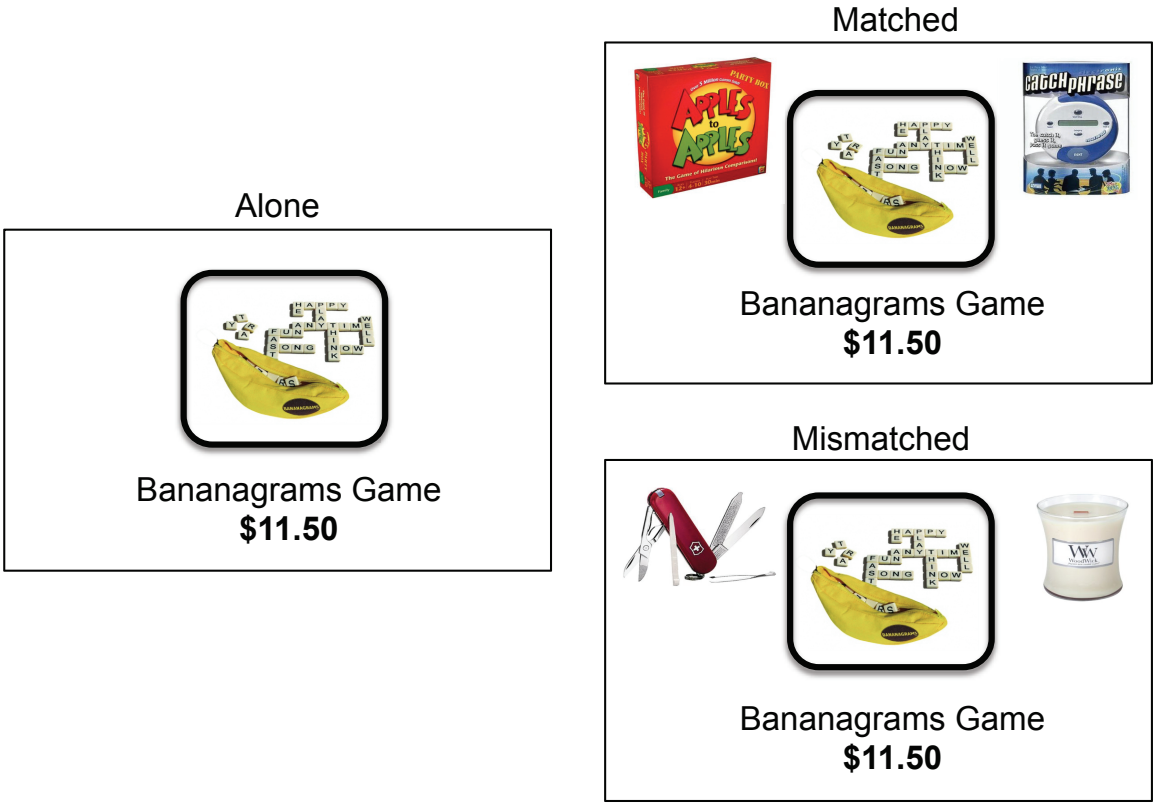


Figure 2: Study 1 & 2 Results. Matched display sets increase purchase intent for target items compared to mismatched ones. **A.** Study 1 results. Data reflects the average purchase intent across all four decisions within-subject. **B.** Study 2, incentive compatible results. Error bars reflect standard errors of the mean, *p<.05.

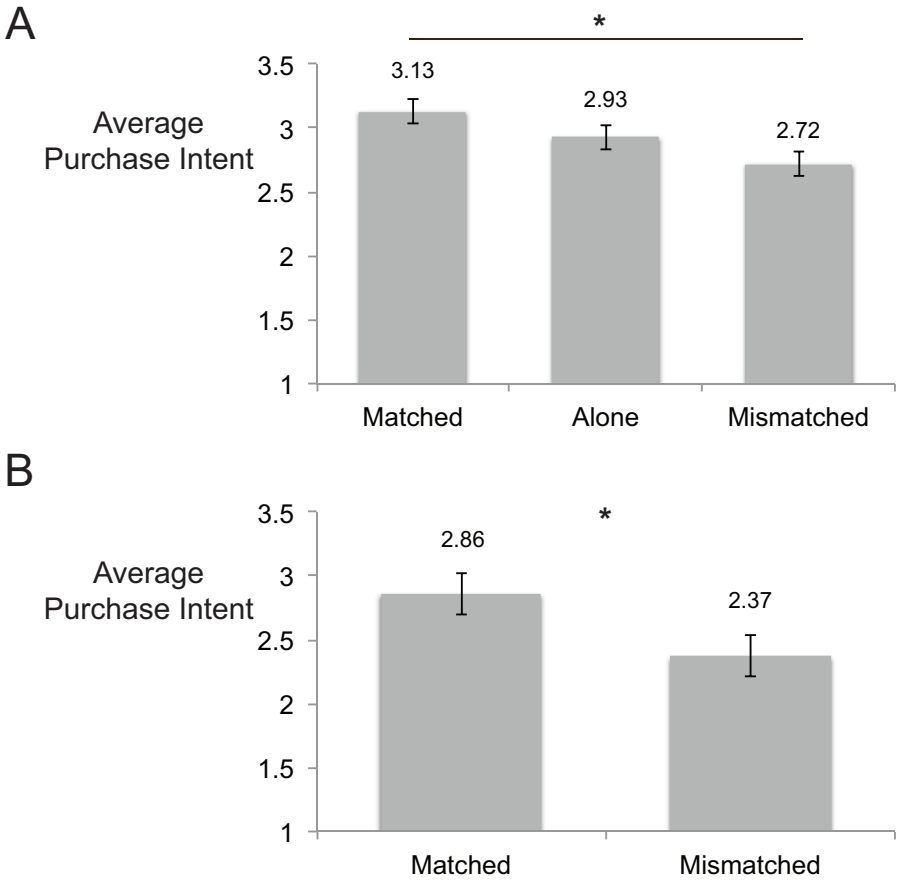
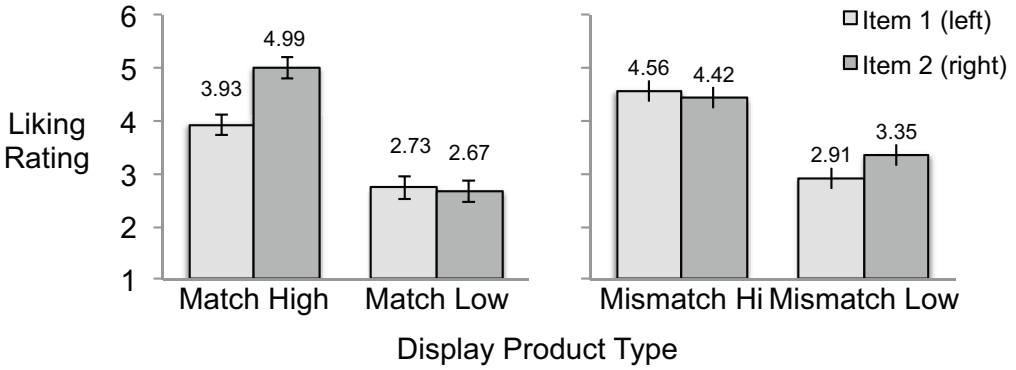


Figure 3: Study 3 Results. A. Manipulation checks : liking ratings are higher for display items in the "High Value" conditions than in the "Low Value" conditions. **B.** Purchase intent is significantly higher in the Matched conditions than the Mismatched conditions, regardless of display item value. Error bars reflect standard errors of the mean, *p<.05.

A



B

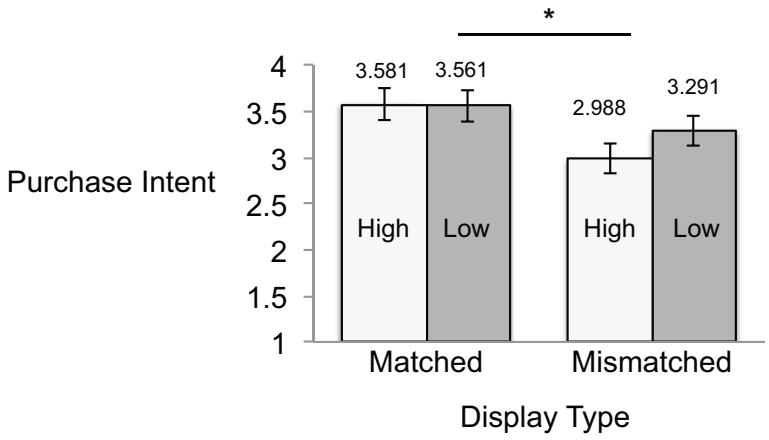


Figure 4: Study 4 Results. Purchase intent (averaged across both decisions within-subject) is significantly higher in Matched versus Mismatched conditions, but is not different between 2-item and 6-item displays. Error bars reflect standard errors of the mean, **p<.01.