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Consumer research has documented dozens of instances in which the introduction of an "irrelevant" third option affects preferences between the remaining two. In nearly all such cases, the unattractive dominated option enhances the attractiveness of the option it most resembles—a phenomenon known as the "attraction effect." In the studies presented here, however, the authors contend that this phenomenon may be restricted to stylized product representations in which every product dimension is represented by a number (e.g., a toaster oven that has a durability rating of 7.2 and ease of cleaning rating of 5.5). Such effects do not typically occur when consumers experience the product (e.g., taste a drink) or when even one of the product attributes is represented perceptually (e.g., differently priced hotel rooms whose quality is depicted with a photo). The authors posit that perceptual representations of attributes do not support the sorts of comparisons that drive the attraction effect with highly stylized examples, and they question the practical significance of the effect.

Keywords: attraction effect, context effects, attribute representation, consumer choice, asymmetric dominance

The Limits of Attraction

The "attraction effect" or "asymmetric dominance effect" (Huber, Payne, and Puto 1982; Huber and Puto 1983) refers to instances in which the addition of an inferior option to a choice set increases the choice share of the option it most closely resembles. The practical significance of such an effect seems clear because the composition of choice sets is readily manipulated. Moreover, by violating central axioms in models of rational choice, the effect is often upheld to illustrate the deficiency of those models and the necessity of developing psychologically richer ones.

For these reasons, the attraction effect is among the most discussed and documented phenomena in the consumer behavior literature (see Appendix A). However, the robustness this summary suggests is misleading, because most demonstrations involve highly stylized stimuli in which the attribute levels of the focal goods are represented by 2 × 2 numeric matrices. Such stimuli may recruit similar psychological processes whether the numbers happen to refer to quality ratings of televisions, durability of digital cameras, attractiveness of romantic partners, honesty of politicians, or capacitance of widgets.

Although such highly stylized stimuli may be sufficient to capture the essential trade-offs consumers routinely make (e.g., between price and quality), the psychological processes they evoke may differ from those evoked by more realistic stimuli. In ordinary purchase settings, it is rare that every attribute would be represented solely by a numeric index. For example, consider consumers who enter an electronics store intent on purchasing a flat-screen television. They do not choose between abstract summaries of the picture quality and prices of two unspecified brands (e.g., [7.3, $390] vs. [8.8, $610]). Instead, they typically stroll around the store, examine various models, and actually experience the quality of images displayed (often brightly colored fish swimming around a coral reef).

Although researchers have been encouraged to test whether attraction effects hold in more natural contexts (see, e.g., Simonson 1989), we are aware of only five studies that report an attraction effect using choice stimuli that are not highly stylized (Kivetz, Netzer, and Srinivasan 2004; Sen 1998; Simonson and Tversky 1992 [two studies]; Trueblood et al. 2013). Notably, we could not replicate the results of any of these studies, as we report in Appendices B–F. Ratneshwar, Shocker, and Stewart (1987) used

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"hybrid" stimuli, which retained numeric indices for all attributes but supplemented numeric summaries of quality with verbal descriptions. We replicated their result using those materials, but when we omitted the numeric index and used *only* the verbal descriptions, we again found no attraction effect (see Appendix G).

This article continues to probe the boundary conditions of the attraction effect. It examines cases in which the relevant attributes can be experienced directly (e.g., beverages with different flavors and concentrations) or options whose attribute levels are represented without numeric indices. In some cases, this is because the attributes are inherently qualitative (e.g., the brand and flavor of microwave popcorn). In other cases, it is because we elected to represent attribute levels perceptually, rather than numerically (e.g., by depicting apartment views with photographs rather than ratings).

Collectively, these studies reveal no evidence for an attraction effect. Against the backdrop of dozens of studies reporting attraction effects using highly stylized stimuli (see Appendix A), our failure to find evidence for these effects implies that attribute representation may play a crucial role. To test this notion further, we present several studies that hold the stimuli constant but manipulate how their attributes are represented. We found attraction effects when stimuli were represented numerically, but not otherwise.

STUDIES 1A–1S: DO ATTRACTION EFFECTS OCCUR WITH REALISTIC STIMULI?

Method

We conducted 19 studies of the attraction effect using "natural" stimuli in which one or more of the product attributes can be experienced, directly perceived, or somehow communicated without the use of numbers (for the stimuli used in Studies 1a–1s, see Appendix H). Aside from this difference, our studies preserved the fundamental structure of other studies on the attraction effect: respondents were randomly assigned to choose between two core options or between options in an expanded set that included a third "decoy" option that was similar, but inferior to, one of the core options. In some cases, these were small stand-alone studies; in other cases, these stimuli were part of larger surveys involving other topics. Participants were drawn from various sources, including respondents from the Massachusetts Institute of Technology (MIT), Singapore Management University (SMU), and Bowling Green University and picnickers at a Fourth of July celebration. Respondents were randomly assigned to conditions, and the total sample sizes for each study ranged from 68 to 681. Tables 1 and 2 summarize the stimuli and results.

Results and Discussion

As Table 2 shows, we found no evidence for an attraction effect in any of these studies: the decoy did not increase the choice share of the option it most closely resembled (the "target"). Indeed, it was just as common for the decoy to *reduce* the choice share of that option—a phenomenon we term a "repulsion effect." For example, in one study, respondents sampled normal-strength cherry Kool-Aid, normal-strength grape Kool-Aid, and diluted grape Kool-Aid (mixed to half the recommended concentration). The addition of a

Table 1
PRODUCT CATEGORIES AND ATTRIBUTES FOR STUDIES 1A–1S

		Attribute Levels of		
Product Class	*Attributes*	*Competitor*	*Target*	*Decoy*
Apartments	Photo of view, floor space	Ocean view, 530 square feet	Apartment view, 910 square feet	Apartment view (dirty window), 905 square feet
Fruit	Type, appearance	Apple Orange	Orange Apple	Moldy orange Bruised apple
Hotel rooms	Photo of decor, price	Average decor, $120 per night	Very nice decor, $180 per night	Nice decor, $180 per night
Jelly beans	Flavor and color	Cherry (red) Apricot (orange) Banana (yellow) Blueberry (blue)	Plum (gray) Chocolate (brown) Apple (green) Marshmallow (beige)	Pepper (gray) Dirt (brown) Grass (green) Earwax (beige)
Kool-Aid	Flavor and concentration	Grape Cherry	Cherry Grape	Diluted cherry Diluted grape
Mints	Brand, flavor	Certs, spearmint	Altoids, spearmint	Altoids, ginger
Movie actors	Actor, film title (with verbal description)	Sylvester Stallone, *Rocky* Arnold Schwarzenegger, *The Terminator*	Arnold Schwarzenegger, *The Terminator* Sylvester Stallone, *Rocky*	Arnold Schwarzenegger, *Hercules in New York* Sylvester Stallone, *Stop! Or My Mom Will Shoot*
Movie sequels	Film title (with verbal description)	*Speed* *Grease*	*Grease* *Speed*	*Grease 2* *Speed 2*
Popcorn	Brand, flavor	Popz, Butter Act-II, Butter	Act-II, Butter Popz, Butter	Act-II, Jalapeno Popz, Jalapeno
Bottled water	Brand, type (with picture of bottle)	Penta Water	Volvic Spring Water	Duck Fart Spring Water
Drinks	Drink type, price	Milk, $2.50	Tropicana orange juice, $3.95	Stop & Shop orange juice, $3.75

Table 2
RESULTS OF STUDIES 1A–1S

Product Category	No Decoy: Target		Decoy Present: Target	Decoy Present: Decoy	% Change in Target's Share Due to Decoy
Apartments					
(n = 256)	43%	→	48%	2%	5%
Fruit					
(n = 187)	62%	→	63%	0%	1%
(n = 184)	38%	→	38%	1%	0%
Hotel Rooms					
(n = 129)	70%	→	67%	13%	–3%
Jelly Beans					
(n = 327)	52%	→	46%	6%	–6%
(n = 348)	35%	→	32%	2%	–3%
(n = 404)	64%	→	56%	10%	–8%
(n = 305)	55%	→	52%	4%	–3%
Kool-Aid (Cherry Target)					
(n = 256)	47%	→	48%	8%	1%
Kool-Aid (Grape Target)					
(n = 260)	53%	→	39%	6%	–13%
Mints					
(n = 251)	55%	→	49%	6%	–6%
Movie Actors					
(n = 170)	55%	→	55%	10%	0%
(n = 165)	45%	→	40%	7%	–5%
Movie Sequels					
(n = 166)	44%	→	36%	6%	–8%
(n = 162)	56%	→	48%	10%	–8%
Popcorn					
(n = 74)	39%	→	31%	5%	–8%
(n = 68)	61%	→	33%	7%	–28%
Bottled Water					
(n = 241)	70%	→	52%	2%	–18%*
Drinks					
(n = 681)	41%	→	39%	13%	–2%

*$p < .01$.
Notes: Significance assessed using a chi-square test.

diluted grape option reduced the choice share of regular grape (from 53% to 39%; $\chi^2 = 3.45$, $p = .06$).[1]

We revisit repulsion effects in the "General Discussion" section, but we emphasize here the most notable result from these studies: the conspicuous absence of an attraction effect. Next, we discuss two possible accounts for this.

EXPLAINING THE ABSENCE OF AN ATTRACTION EFFECT WHEN ATTRIBUTE VALUES ARE NONNUMERIC

Comparing Trade-Off Rates Requires Numeric Specification

As one possible account of the attraction effect, Simonson and Tversky (1992) discuss the notion of "trade-off contrast." To illustrate this account, consider three cars that vary in fuel efficiency (in miles per gallon [MPG]) and price:

A = (25 MPG; $25,000),
B = (35 MPG; $35,000),
C = (36 MPG; $42,000).

Fuel efficiency is cheaper moving from A to B ($1,000 per unit) than from B to C ($7,000 per unit), and this comparison may favor B. Of course, computing trade-off rates requires that both dimensions be numeric, which might help explain why we did not observe attraction effects in Studies 1a–1s.

Effects of Range and Number of Levels

In some cases, a decoy increases the considered range for the attribute on which the target is inferior, "shrinking" the perceived significance of that difference (see Parducci 1974) and thereby enhancing its attractiveness relative to the other core option.[2] Depending on its location in attribute space, the decoy may also more finely partition the dimension on which the target is superior, which usually increases the weight this dimension receives (Currim, Weinberg, and Wittink 1981). Such effects are less applicable when attribute values are not represented by numbers—when the decoy is inferior to the target in a qualitative rather than quantitative sense. For example, it is not clear how adding diluted grape Kool-Aid to the choice set (regular cherry, regular grape) either shrinks the perceived significance of grape's lack of cherry flavor or serves to partition the distance, in n-dimensional space, between grape and cherry.

In light of the aforementioned theoretical reasons and the (non) results from Studies 1a–1s, we propose that attraction effects could be attenuated, eliminated, or possibly even reversed if product attributes were represented as percepts that could be directly experienced rather than as concepts (in the form of numeric indices of attribute levels). We test this theory next.

STUDIES 2A–2C: NUMERIC VERSUS PERCEPTUAL REPRESENTATIONS OF PROBABILITY IN CHOICES AMONG GAMBLES

Our stimuli in Studies 2a–2c were gambles varying in probability of winning and winning amount. In line with prior research involving gambles (Huber, Payne, and Puto 1982; Wedell 1991), we expected to find an attraction effect when the probability of winning is represented numerically. However, from the results of the aforementioned studies, we conjectured that if probability was presented visually (in the form of the shaded area of a probability wheel), these effects would be attenuated or eliminated. We conducted three studies using similar methods.

Study 2a

In Study 2a, a total of 507 participants (276 picnickers in Boston and 231 participants from a national online panel hosted by Yale Univeristy) chose between two (or three)

[1]In all cases, we report the raw percentage of participants who chose the target with and without the decoy. However, we conducted our statistical tests on adjusted values that were maximally conservative with respect to claiming violations of regularity. Namely, when the decoy increased the choice share of the target (suggesting attraction effects), we attributed the fraction choosing the decoy to the competitor. When the decoy reduced the choice share of the target (suggesting repulsion effects), we attributed the fraction choosing the decoy to the target. The distinction is significant only when the fraction choosing the decoy becomes appreciable. Without this correction, we would find a few more instances of repulsion and attraction effects that reached conventional levels of statistical significance.

[2]For a perceptual example, someone who estimates the temperatures of a tepid and a warm bucket of water will regard them as differing more than someone who first experiences a hot bucket of water before estimating the respective temperatures of the two cooler buckets (i.e., the hot bucket will make the two cooler buckets seem more similar).

gambles. The two samples showed similar choice patterns and were combined in our analysis. The core set included a safe gamble (73% of chance of winning $197) and a risky gamble (28% chance of winning $516). The three-option choice set also included a third, decoy gamble (23% chance of winning $507) that was dominated by the risky gamble. Using a 2 × 2 design, we manipulated the presence or absence of the decoy gamble and the mode by which winning probability was represented: either numerically (as it typically is) or perceptually (as the shaded region of a probability wheel, depicted in Figure 1).

Study 2a Results and Discussion

When probability was represented numerically, we found a significant attraction effect, as the decoy increased the choice share of the target risky gamble from 14% to 28% ($\chi^2 = 7.22$, $p < .01$). However, when probability was represented as the shaded region of a probability wheel, the decoy had no effect on the choice share of the target gamble (24% vs. 26%), as Table 3, Panel A, shows.

Study 2b

Our follow-up study, Study 2b, involved 791 respondents recruited from a private northeastern U.S. university and a national online panel, using a different set of gambles. Participants chose between two gambles (a 73% chance to win $12 vs. 28% chance to win $33) or three gambles (those two plus a third decoy option: a 28% chance to win $30). As in Study 2a, the winning probabilities were represented either numerically or pictorially (see Figure 2).

Study 2b Results and Discussion

As in Study 2a, we found a significant attraction effect when probability was represented numerically, as the presence of the decoy nearly doubled the choice share of the risky gamble (21% to 37%; $\chi^2 = 11.55$, $p < .001$). However, when probability was represented as the shaded area of a probability wheel, the decoy had no effect (34% vs. 35%), as Table 3, Panel B, shows.[3]

[3]Participants rarely chose the decoy in either condition, suggesting that the dominance relation was salient in both. Moreover, the mean judgments in Study 2c reveal a close correspondence between the stated probability and the probability as judged from the pictures. The safe gamble was estimated to have a 71% of winning (truth = 73%). The risky gamble (and its decoy) were estimated to have a 28% chance of winning (truth = 28%).

Study 2c

Study 2c, our third study involving gambles, was completed by 511 picnickers in Boston and used stimuli nearly identical to those shown in Figure 2. Probability was represented visually for all participants, but half of the participants provided numerical estimates of the probability represented before making their choice. The remainder did so after choosing (which presumably did not affect their choices). We conjectured that an attraction effect might occur if ratings preceded choices because the visual representation would then be supplemented with a numeric representation (albeit one the participants themselves provided).

Study 2c Results and Discussion

As Table 3, Panel C, illustrates, we found no evidence for an attraction effect in either condition. Although participants

Table 3
RESULTS OF STUDY 2

A: Study 2a			
Probability Representation	*73% Chance to Win $197 (Competitor)*	*28% Chance to Win $516 (Target)*	*23% Chance to Win $507 (Decoy)*
Numeric	86% $_{111}$ 71% $_{90}$	14% $_{18}$ 28% $_{35}$	— 2% $_{2}$
Visual	76% $_{100}$ 74% $_{89}$	24% $_{31}$ 26% $_{31}$	— 0% $_{0}$
B: Study 2b			
Probability Representation	*73% Chance to Win $12 (Competitor)*	*28% Chance to Win $33 (Target)*	*28% Chance to Win $30 (Decoy)*
Numeric	79% $_{156}$ 63% $_{125}$	21% $_{42}$ 37% $_{73}$	— 0% $_{1}$
Visual	66% $_{125}$ 65% $_{132}$	34% $_{65}$ 35% $_{71}$	— 0% $_{1}$
C: Study 2c			
Conditions	*73% Chance to Win $12 (Competitor)*	*28% Chance to Win $33 (Target)*	*28% Chance to Win $30 (Decoy)*
Choices precede numeric estimates	60% $_{75}$ 64% $_{84}$	40% $_{51}$ 30% $_{39}$	— 6% $_{8}$
Numeric estimates precede choices	71% $_{81}$ 71% $_{99}$	29% $_{33}$ 23% $_{32}$	— 6% $_{9}$

Notes: The subscripts are counts from which percentages are computed.

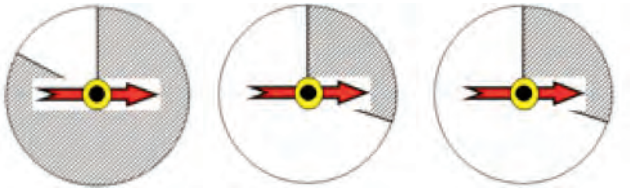
Figure 1
STIMULI FROM STUDY 2A

Suppose that for the gambles below, you get to spin the pointer, and if it lands anywhere in the **black** area, you win the amount shown. Which of the gambles below would you choose?

$197 $516 $507

Figure 2
STIMULI FROM STUDY 2B

Suppose that for the gambles below, you get to spin the pointer, and if it lands anywhere in the **shaded** area, you win the amount shown. Which of the gambles below would you choose?



$12 $33 $30

had access to essentially the same set of numbers as those in the numeric conditions of Studies 2a and 2b, the mere presence of a visual representation was apparently sufficient to inhibit the effect.[4] The studies we discuss next are analogous to the gamble studies. The focal goods are television sets, and we manipulated how image quality was represented.

STUDIES 3A–3C: NUMERIC VERSUS PERCEPTUAL REPRESENTATIONS OF IMAGE QUALITY IN CHOICES AMONG TELEVISION SETS

Study 3a

A total of 240 respondents from MIT and Singapore Management University (SMU) chose between televisions that varied in price and picture quality. Using a 2 × 2 between-subjects design, we manipulated whether the choice set contained a decoy option and the mode by which image quality was represented (with a numeric rating or a photo).

To represent image quality visually, we created high-quality, medium-quality, and low-quality images using graphics software to manipulate color, sharpness, contrast, and resolution (see Figure 3). To create a corresponding numeric condition, we used the average ratings of a separate group of 80 respondents who rated the picture quality of each of these three images on a ten-point scale (1 = "low quality," and 10 = "high quality"). This led to the corresponding set of numeric stimuli, with the second number representing average ratings of image quality ([$503, 8.0], [$350, 5.5], [$339, 3.5]). Note that the medium-quality television ($350, 5.5) almost dominates the low-quality television ($339, 3.5) because it has a much higher quality rating for only $11 more.

Study 3a Results and Discussion

As Table 4, Panel A, shows, when image quality was represented numerically, adding the low-quality decoy television caused a significant attraction effect, increasing the choice share of the target television from 33% to 57% ($\chi^2 = 6.60$, $p < .05$). However, when picture quality was represented with an image, the decoy *decreased* the choice share of the target from 53% to 35% ($\chi^2 = 3.37$, $p = .07$). A logistic regression with dummy variables for decoy presence and mode of quality representation yielded the expected significant interaction term ($\beta = -1.71$, $p < .01$). Although our prior results—and, more to the point, our repeated nonresults—led us to predict no attraction effect when quality was represented visually, we were curious whether the marginally significant repulsion effect we obtained would replicate, so we reran the study using Google Surveys, which enabled us to obtain very large samples quickly.[5]

Figure 3
STIMULI FROM STUDY 3A

Suppose you are buying a second television. Assuming that all the ones below have the same screen size, which would you choose? (Please select one.)

A (Price: $503)

B (Price: $350)

C (Price: $339)

Study 3b

A total of 4,033 people browsing the Web answered our question, yielding approximately 1,000 respondents for each of the aforementioned four conditions. In Study 3b, we used a nearly identical design to that of Study 3a, although options were displayed vertically when quality was represented as a number (see Figure 4, Panel A) and horizontally when quality was represented visually (as small thumbprints that expanded when the cursor was dragged over them; see Figure 4, Panel B). Furthermore, we did not ask respondents to assume that they were purchasing a second television, and we specified that the televisions in question were 42-inch LED flat screens. The order of option presentation was randomized in all conditions.

[4]Although the effect was orthogonal to our interests, the request to estimate probability before choosing increased the choice share of the safer, higher-probability gamble (71% vs. 62%; $\chi^2 = 4.63$, $p < .03$).

[5]On Google Surveys, the focal question is presented to web surfers who had not expected to be asked any questions. Their "payment" for providing an answer is continued access to the online content, and their payment for considering the question carefully is the satisfaction of having their preferences accurately represented. Thus, we anticipated that some would answer randomly to regain access to the web page as quickly as possible, but that we might still be able to extract a signal from the subset who gave the question some consideration.

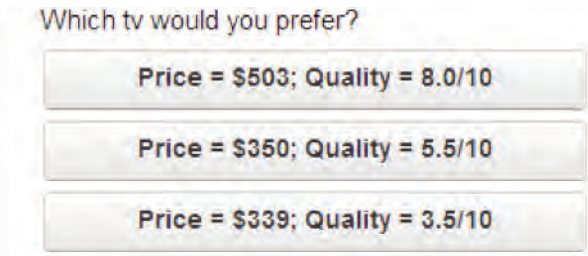
Table 4
RESULTS OF STUDY 3

Representation of Picture Quality	*High Quality $503 (Competitor)*	*Medium Quality $350 (Target)*	*Low Quality $339 (Decoy)*
A: Study 3a			
Numeric	67% $_{40}$ 42% $_{25}$	33% $_{20}$ 57% $_{34}$	— 2% $_{1}$
Visual	47% $_{28}$ 64% $_{38}$	53% $_{32}$ 35% $_{21}$	— 2% $_{1}$
B: Study 3b			
Numeric	71% $_{714}$ 56% $_{563}$	29% $_{292}$ 28% $_{281}$	— 16% $_{161}$
Visual	76% $_{771}$ 70% $_{703}$	24% $_{244}$ 17% $_{174}$	— 13% $_{130}$
C: Study 3b with Zeroed Decoy			
Numeric	90% $_{473}$ 77% $_{403}$	10% $_{51}$ 23% $_{120}$	— Zeroed
Visual	92% $_{576}$ 93% $_{573}$	8% $_{49}$ 7% $_{44}$	— Zeroed
D: Study 3c			
Conditions	*High Quality $503 (Competitor)*	*Medium Quality $350 (Target)*	*Low Quality $339 (Decoy)*
Choices precede ratings	66% $_{307}$ 58% $_{293}$	34% $_{158}$ 37% $_{189}$	— 5% $_{27}$
Ratings precede choices	66% $_{321}$ 49% $_{239}$	34% $_{167}$ 41% $_{197}$	— 10% $_{47}$

Notes: The subscripts are counts from which percentages are computed.

Figure 4
EXAMPLE OF STUDY 3B STIMULI

A: Picture Quality Represented Numerically



B: Picture Quality Represented Visually

Study 3b Results and Discussion

Table 4, Panel B, provides the raw results. Unlike the prior paper-and-pencil study, the decoy option was chosen frequently in this context, which complicates interpretation of the results. However, if we assume that (1) those who chose the decoy were simply answering randomly, (2) similar numbers of participants randomly selected the other presented options, and (3) the incidence of random responding does not depend on the number of options considered, we can adjust the data as shown in Table 4, Panel C.

The adjusted data replicate one aspect of the prior study: we found significant attraction effects when quality was represented numerically ($\chi^2 = 33.6, p < .0001$) but no effect when quality was represented visually ($\chi^2 = .2, p = .64$). We did not find further evidence of a repulsion effect.

Study 3c

Mirroring Study 2c, we conducted a follow-up study in which all respondents could view images but in which they also provided ratings of image quality either *after* choosing (which should mimic the visual conditions from the prior studies) or *before* choosing (thus creating the hybrid "visual + numeric" condition of interest).[6] A total of 1,945 respondents participated: 1,581 participants from Amazon.com's Mechanical Turk (MTurk) and 364 participants from Columbia University and Cornell University. Image quality was represented as in Study 2a (though in this study, prices were listed *above* the photos that displayed image quality).

Results and Discussion

Table 4, Panel D, presents the results. As we predicted, the decoy had no significant effect when ratings followed choices. However, this time we did find a small but significant attraction effect in the hybrid condition, as the presence of the decoy increased the choice share of the target from 34% to 41% ($\chi^2 = 4.47, p = .03$).[7]

[6]For our MTurk participants, we also manipulated *how* those judgments were made: either with numbers (from 1 to 100) or on an unmarked slider bar whose endpoints were labeled "Poor" and "Excellent." The manner of the ratings did not have an appreciable effect, so we pooled across this manipulation.

[7]We conducted six related studies in which we explored various ways of representing image quality and download time (see Appendix I). We found no significant contextual effects in any of them (though sample sizes were modest due to the number of experimental variations). Thus, although the study supported our contention that the attraction effect is rare outside fully numeric specifications, it did not foster our goal of clarifying boundary conditions. For these reasons, and because the conditions were not easily summarized, we relegated this study to Appendix I. We nevertheless wanted to include it for completeness so as to counter the argument that we only reported studies that *failed* to show significant effects.

GENERAL DISCUSSION

The attraction effect (i.e., asymmetric dominance effect or decoy effect) is among the most studied and celebrated phenomena in the behavioral marketing literature and is widely asserted to be large, robust, and important:

> [We conclude] that the attraction effect is robust, has a wide scope, is quite sizeable and is of practical significance. (Doyle et al. 1999, p. 225)

> Decoy effects ... occur in product classes ranging from restaurants to light bulbs and occur regardless of whether choice sets are manipulated between subjects or within subjects. [They] are important for both theory and practice. (Heath and Chatterjee 1995, p. 268)

> [T]he attraction effect is a real-world phenomenon, not just an experimental artifact. (Mishra, Umesh, and Stem 1993, p. 331)

> Asymmetric dominance and advantage (decoy) effects can exert a powerful force on choice because they provide a compelling justification for the purchase of one option over another. (Kivetz, Netzer, and Srinivasan 2004, p. 265)

> [The attraction effect is] a general feature of human choice behavior because [it is] a fundamental part of decision-making processes. (Trueblood et al. 2013, p. 906)

Popular literature has consumed and promulgated this message as well. The opening chapter of the bestseller *Predictably Irrational: The Hidden Forces That Shape Our Decisions* (Ariely 2008) focuses almost exclusively on the attraction effect as one of the irrational tendencies to which people are predictably vulnerable. Amid discussions of missing internal value meters that necessitate a focus on relative advantages, claims that attraction effects should be potent and ubiquitous seem believable enough. As proof of concept, Ariely cites a result from his Master of Business Administration (MBA) class suggesting that the addition of a decoy option increases the choice share of the target option from 32% to 84%.[8]

Our research suggests a different conclusion. Outside the most abstract contexts, we find no evidence for this effect, and we failed to replicate several of the results most frequently cited as evidence, including the one just mentioned. In total, we conducted 38 studies: the 19 summarized as Studies 1a–1s, the 6 presented in Studies 2a–2c and 3a–3c, the 6 replication attempts outlined in Appendices B–G, a conceptual replication in Appendix G, and 6 related studies summarized in Appendix I. In five instances (one pair of conditions in Studies 2a, 2b, 3a, and 3b and condition 1 in Appendix I), our stimuli were highly abstract, consisting of two-dimensional matrices of numbers that specified attribute levels. We found significant attraction effects in four of those five cases. In five other instances (one pair of conditions each from Studies 2c and 3c, the first study reported in Appendix G, and conditions 3 and 5 from Appendix I), all relevant attributes were numerically specified, but at least one was accompanied by a perceptual representation or verbal description. We found a significant attraction effect in two of these five cases (Study 3c and the first study in Appendix G). The remaining 27 studies (Studies 1a–1s; Appendices B–F, and conditions 2, 4, and 6 in Appendix I) involved choice stimuli in which at least one of the attributes could be directly experienced (e.g., beverages and jelly beans that were actually consumed, facial tissues that were actually touched, apartment views depicted by photographs). We found no instances of a significant attraction effect (and one instance of a significant repulsion effect).

We believe that these results warrant three conclusions: (1) Consumer researchers should reconsider the status of the attraction effect as a stylized fact; (2) perceptual representations often elicit markedly different effects than numeric representations; and (3) outside the domain of the highly abstract stimuli that have dominated research on this topic, repulsion effects may be more common than attraction effects. Surprisingly, there has been virtually no experimental work on repulsion effects. The experiment closest to those we conducted was a thought experiment in David Kreps's (1990) microeconomics textbook in which he proposes that the consideration of mediocre French food might diminish the attractiveness of excellent French food (p. 28).[9] This neglect of the repulsion effect is surprising, considering that (1) this intuition has been formalized as the law of similarity, whereby the bad properties of one object are transferred to other objects in that category (Rozin, Haidt, and McCauley 2000; Rozin, Millman, and Nemeroff 1986; Rozin and Nemeroff 2002); (2) there is widespread evidence for both contrast and assimilation effects within the extensive body of literature on context effects in psychology (Bless and Schwarz 1998; Mussweiler, Rüter, and Epstude 2004); and (3) it could help explain unsuccessful brand extensions (e.g., Bic underwear), in which unattractive products taint more successful products sharing the same brand name (Hertwig et al. 2004; Kotler and Keller 2005).

Concluding Remarks

As part of a curriculum in consumer behavior, the attraction effect fascinates. Students are understandably spellbound to learn about a simple trick that promises to nearly triple the number of customers choosing a firm's most profitable product (see Ariely 2008, p. 6). However, we believe that the truth is much less exciting than this story. The boundary conditions for the effect seem to be so restrictive that its practical validity should be questioned. We doubt that the academics who read this will amend their courses by removing slides that reliably elicit "oohs" and "aahs," but we hope our article gives pause to those citing the effect and stimulates more discussion about the aspects of ecological validity that must be preserved to draw valid inferences from consumer research.

[8]Ariely's featured example is identical to one discussed in Kivetz, Netzer, and Srinivasan (2004). They report effects that are somewhat less incredible, though still striking, as the presence of the decoy increased choice share of the target from 43% to 72%.

[9]Aaker (1991) proposes that the presence of the decoy may sometimes help the competitor option by making it more unique, but her "black sheep" effect is not about dominance per se. It would predict that the choice share of an apple would be increased by adding a second perfect orange to a choice set consisting of a perfect apple and a perfect orange.

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Appendix A

LIST OF STIMULI AND ATTRIBUTES USED IN ARTICLES ON THE ATTRACTION EFFECT

Research	*Stimuli*	*Attributes*	*Attribute Representation*
Ariely and Wallsten (1995)	Microwaves	Price, capacity (feet), wattage	Numeric
	Running shoes	Comfort, durability, price	Numeric
	Computers	Speed (Hz), memory (MB), price	Numeric
	Televisions	Screen size (inches), price, wattage	Numeric
	Bicycles	Price, weight (pounds), wheel base (inches)	Numeric
Bhargava, Kim, and Srivastava (2000)	Cars	Quality of ride, fuel	Numeric
	Flights	Price, penalty	Numeric
Branstrom (1998)	Apartments	Monthly rent, distance from campus (minutes)	Numeric
Burton and Zinkhan (1987)	Beers	Price, taste quality	Numeric
	Restaurants	Food quality, driving time	Numeric
Choplin and Hummel (2002)	Airplane tickets	Cost, layover (minutes)	Numeric
	Studio apartments	Rent, commute (minutes)	Numeric
Colman, Pulford, and Bolger (2007)	Game strategies	Payout	Numeric
Dhar and Glazer (1996)	Automobiles	Comfort rating, gas mileage	Numeric
	Stereos	Sound rating, reliability	Numeric
	Apartments	Distance (miles), condition rating	Numeric
	Managers	Technical rating, human skill rating	Numeric
	MBA applicants	Graduate Management Admission Test score, grade point average	Numeric
	Beer	Quality, price per six-pack	Numeric
	Batteries	Life (hours), price per pair	Numeric
	Restaurants	Food quality, driving time (minutes)	Numeric
	VCRs	Picture rating, reliability rating	Numeric
Doyle et. al. (1999)	Audiocassette tapes	Price, quality	Numeric
	Batteries	Price, quality	Numeric
	Orange juice	Price, quality	Numeric
Ha, Park, and Ahn (2009)	Vacation tours	Vacation site, hotel service quality, hotel location	Numeric
	Laptop computers	Brand, weight, memory capacity	Numeric
	Camera phones	Phone type, screen size, resolution	Numeric
Heath and Chatterjee (1991, 1995)	Beers	Price, quality rating	Numeric
	Cars	Car mileage, ride quality	Numeric
Hedgcock, Rao, and Chen (2009)	Beers	Price, quality	Numeric
	Health care plans	Maximum coverage, copay, percentage donor participation	Numeric
	Cruises	Price, incidence of disease	Numeric
	Housing	Crime rate, number of bedrooms	Numeric
	Cars	Safety, lease terms	Numeric
	Presidential candidates	Economic policy, international policy	Numeric
Highhouse (1996)	Job candidates	Interview rating, promotability rating	Numeric

Appendix A

LIST OF STIMULI AND ATTRIBUTES USED IN ARTICLES ON THE ATTRACTION EFFECT

Research	*Stimuli*	*Attributes*	*Attribute Representation*
Huber, Payne, and Puto (1982), Huber and Puto (1983)	Beers	Price per six pack, quality	Numeric
	Cars	Ride quality, gas mileage (MPG)	Numeric
	Restaurants	Driving time (minutes), food quality	Numeric
	Lotteries	Chance of winning, amount of win	Numeric
	Films	Developing time (minutes), color fidelity	Numeric
	Televisions	Percent distortion, reliability	Numeric
	Calculator batteries	Estimated life (hours), price per pair	Numeric
Kim and Hasher (2005)	Grocery discounts	Discount offered (%), minimum purchase required ($)	Numeric
	Extra credit	Extra credit offered (points), minimum amount of time (minutes)	Numeric
Kivetz, Netzer, and Srinivasan (2004)	Subscriptions	Cost, type	Qualitative
Mishra, Umesh, and Stem (1993)	Beers	Price per six pack, quality	Numeric
	Cars	Ride quality, gas mileage	Numeric
	Televisions	Percent distortion, reliability	Numeric
Moran and Meyer (2006)	Vacation deals	Price, hotel quality	Numeric
		Duration, hotel quality	Numeric
Olsen and Burton (2000)	Cars	Gas mileage, reliability rating	Numeric
Pan and Lehmann (1993)	Televisions	Resolution (lines), durability (months)	Numeric
	Apartments	Size (square feet), proximity to campus (seconds)	Numeric
	Batteries	Expected life (hours), price	Numeric
	Compact sedans	Fuel efficiency (MPG), acceleration	Numeric
	Lightbulbs	Expected life (hours), light output	Numeric
Pan, O'Curry, and Pitts (1995)	Political candidates	Education, crime control, tax policy	Numeric
Prelec, Wernerfelt, and Zettelmeyer (1997)	Air conditioners	Operating noise rating, price	Numeric
	Binoculars	Magnifying power, price	Numeric
	Auto-focus cameras	Number of features, price	Numeric
	Coffeemakers	Quality rating, price	Numeric
	Rain boots	Durability rating, price	Numeric
	Running shoes	Cushioning ability rating, price	Numeric
	Vacuum cleaners	Suction power rating, price	Numeric
	VCRs	Durability rating, price	Numeric
Ratneshwar, Shocker, and Stewart (1987)	Televisions	Percent distortion, reliability (years)	Numeric[a]
	Orange juice	Price per 64-ounce container, quality rating	Numeric[a]
	Beers	Price per six pack, quality rating	Numeric[a]
	Cars	City mileage (MPG), ride quality	Numeric
	Lightbulbs	Light output (lumens), expected life hours	Numeric
	Gas barbeque grills	Cooking area (square inches) fuel tank capacity (hours)	Numeric
Scarpi (2008)	MP3 players	Price, data capacity	Numeric
Schwartz and Chapman (1999)	Medications	Treatment effectiveness, probability of side effects	Numeric
Sedikides, Ariely, and Olsen (1999)	Partner attributes	Attractiveness, honesty, sense of humor, dependability, intelligence	Numeric
Sen (1998)	Restaurants	Food, atmosphere	Qualitative
Simonson (1989)	Beer	Price per six-pack, quality	Numeric
	Cars	Ride quality, gas mileage	Numeric
	Color televisions	Price, picture quality	Numeric
	Apartments	Distance, general condition	Numeric
	Calculators	Number of functions, probability of repair in first two years	Numeric
	Mouthwashes	Fresh breath effectiveness, germ-killing effectiveness	Numeric
	Calculator batteries	Expected life (hours), probability of corrosion	Numeric
Simonson and Tversky (1992)	Microwave ovens	Capacity, price, discount	Numeric
	Paper products	Quality (of paper towels vs. facial tissues)	Perceptual
	Cash versus pens	Quality (of pens)	Perceptual
	Gasolines	Quality (amount of octane), price per gallon	Numeric
	Personal computers	Memory (K), price	Numeric
Tentori et al. (2001)	Supermarket discounts	Discount offered (%), minimum purchase required ($)	Numeric
Trueblood et al. (2013)	Rectangles	Length, width	Perceptual
Wedell (1991)	Gambles	Chance of winning, amount of win	Numeric
	Cars	Ride quality, gas mileage (MPG)	Numeric
	Restaurants	Quality rating, driving time (minutes)	Numeric
	Televisions	Percent distortion, reliability	Numeric
Pettibone and Wedell (2000), Wedell and Pettibone (1996)	Computers	Processing speed (MH), size of hard drive (MB)	Numeric
	Restaurants	Price of meal for two, wait to be served (minutes)	Numeric
	Plane tickets	Cost of ticket ($), length of layover (minutes)	Numeric
	Mechanics	Warranty length (days), experience (years)	Numeric
	CD players	Price, number of disks	Numeric
	Apartments	Rent, distance (minutes)	Numeric

Appendix A
CONTINUED

Research	*Stimuli*	*Attributes*	*Attribute Representation*
	Cars	MPG, number of safety features	Numeric
	Boats	Number of passengers, speed (knots per hour)	Numeric
	Job offers	Number of days of sick leave, number of paid holidays	Numeric
	Houses	Price (thousands of $), square footage	Numeric
	Electric keyboards	Tone quality (1–100), number of features	Numeric
	Mini-LCD televisions	Price, percent distortion	Numeric
	Preschools	Children per classroom, teacher's experience (years)	Numeric
	Microwaves	Warranty (months), cooking power (watts)	Numeric
	Parking spaces	Price per month, distance from work (blocks)	Numeric
	Video cameras	Weight (pounds), number of features	Numeric
	Beer (24-packs)	Price, quality (1–100)	Numeric
	Cars	Ride quality (1–100), MPG	Numeric
	Restaurants	Distance from home (minutes), quality (1–5 stars)	Numeric
	Televisions	Percent distortion, average life span (years)	Numeric
Zhou, Kim, and Laroche (1996)	Cars	City mileage (MPG), ride quality rating	Numeric
	Orange juice	Price, quality rating	Numeric
	Calculators	Number of functions, probability of repair in first two years	Numeric

[a]The numeric ratings were supplemented with verbal descriptions.

APPENDIX B: ATTEMPT TO REPLICATE KIVETZ, NETZER, AND SRINIVASAN (2004)

Summary of Original Study

In an MBA classroom, Kivetz, Netzer, and Srinivasan (2004) asked 29 students to choose one of three subscription options. A second group of 30 students selected their preferred option from a smaller choice set that excluded the $125 "print-only" subscription listed second (which could be considered a dominated option given that a print and web subscription was available for the same price). Figure B1 presents the stimuli. Consistent with an attraction effect, the authors report that the participants chose the more expensive "combo" subscription significantly more often in the larger choice set that included the ostensible decoy (72% vs. 43%; $p < .02$).

Figure B1
SUBSCRIPTION OPTION STIMULI

Attempted Replications

Our first attempt to replicate this result involved a large (N = 515) sample of picnickers in Boston who completed a questionnaire in exchange for an ice cream bar. For half our participants (N = 256), our materials and design were identical to those described previously. For the remainder (N = 259), we included a no-purchase option. Neither design revealed an attraction effect (see Table B1).

Later, we made a second attempt to replicate this result, using a large (N = 2,003) sample of respondents on Google Surveys. The materials and design were identical to those described previously with two exceptions: (1) respondents saw only the options themselves, not the rest of the screenshot; and (2) we counterbalanced the order in which the two (or three) options were presented. Again, we found no evidence of an attraction effect, although the substantial fraction of respondents who selected the print subscription confounds the interpretation of the noneffect (see Table B2).

Table B1
RESULTS OF FIRST KIVETZ, NETZER, AND SRINIVASAN (2004) REPLICATION ATTEMPT

Conditions	*Web (Competitor)*	*Print + Web (Target)*	*Print (Decoy)*	*No Choice*
Direct replication	74% $_{85}$	26% $_{30}$	—	—
	69% $_{97}$	23% $_{32}$	9% $_{12}$	—
Replication with no choice	38% $_{49}$	14% $_{18}$	—	48% $_{61}$
	27% $_{36}$	15% $_{20}$	9% $_{12}$	48% $_{63}$

Table B2
RESULTS OF SECOND KIVETZ, NETZER, AND SRINIVASAN (2004) REPLICATION ATTEMPT

Web (Competitor)	*Print + Web (Target)*	*Print (Decoy)*
75% $_{753}$	25% $_{248}$	—
61% $_{614}$	21% $_{211}$	18% $_{177}$

APPENDIX C: ATTEMPT TO REPLICATE SEN (1998)

Summary of Original Study

Sen (1998) conducted two studies involving short verbal descriptions of restaurants that differed in the quality of the food and atmosphere. In Study 1 from that article, 96 participants were randomly assigned to choose from either the core set (N = 50) or an extended set (N = 28) that included a restaurant whose description was intended to make it a decoy for the "good food, bad atmosphere" restaurant. Sen reported that adding an asymmetrically dominated decoy increased the choice share of the target (from 38% to 61%).[10]

Attempted Replication

We recruited 200 participants from MTurk. We excluded one for failing an instructional manipulation check. Participants chose between two (or three) Italian restaurants whose attributes were described. We randomized presentation order (for the sample stimulus, see Table C1). Restaurant A is the competitor, B is the target, and C is the intended decoy.

Results and Discussion

Our sample was more than twice as large as the original study, and we found no significant effect ($\chi^2 = .05$, $p > .83$). Table C2 presents the results.

Table C1
SEN (1998) REPLICATION ATTEMPT SAMPLE STIMULUS

	Food	*Atmosphere*
Restaurant A	Okay-tasting food, average portions, only use commercial pasta	Flawless service; chic, beautiful crowd in stunning elegant bistro
Restaurant B	Superb taste, hearty portions, often serve homemade pasta	Curt, inattentive waiters, dirty tablecloths; patrons are too noisy
Restaurant C	Fair-sized portions, nice food, homemade pasta on rare occasions	Extremely slow, rude service, screaming children amid tacky furniture

Table C2
RESULTS OF SEN (1998) REPLICATION ATTEMPT

Competitor	*Target*	*Decoy*
53% $_{52}$	47% $_{47}$	—
47% $_{47}$	49% $_{49}$	4% $_{4}$

APPENDIX D: ATTEMPT TO REPLICATE SIMONSON AND TVERSKY'S (1992) PEN STUDY

Summary of Original Study

Simonson and Tversky (1992) asked 221 participants to imagine they had received $6. Approximately half of them (N = 106) indicated whether they would exchange that money for a Cross pen. For the remaining half (N = 115), a less attractive Sheaffer pen was added as a third option for which they could exchange any money they might receive. (Participants were told, truthfully, that some participants would receive the option they selected). As the authors intended, the Sheaffer pen was unpopular (only 2% chose it), though its presence increased the fraction who chose to exchange their money for the Cross pen from 36% to 46%—a marginally significant effect (t = 1.5, $p < .10$).

Replication Method

Our replication attempt involved a total of 518 picnickers in Boston who completed a longer study in exchange for an ice cream bar. The choices were hypothetical, but the study was otherwise essentially identical to that of Simonson and Tversky (1992). (We crossed the choice set manipulation with the way the exchange was phrased: either as trading $6 for a pen, as in the original study, or as a choice between the presented options.)

Results and Discussion

We find no evidence of an attraction effect, regardless of the way the choice was phrased. Table D1 presents the results.

Table D1
RESULTS OF SIMONSON AND TVERSKY (1992) PEN STUDY REPLICATION ATTEMPT

Frame	*$6 (Competitor)*	*Cross Pen (Target)*	*Bic Pen (Decoy)*
Endowed money	67% $_{79}$	33% $_{39}$	—
	68% $_{99}$	30% $_{44}$	1% $_{2}$
Choice	62% $_{77}$	38% $_{47}$	—
	58% $_{76}$	32% $_{42}$	10% $_{13}$

APPENDIX E: ATTEMPT TO REPLICATE SIMONSON AND TVERSKY'S (1992) PAPER TOWEL STUDY

Summary of Original Study

Simonson and Tversky (1992) asked 221 participants to choose either a box of facial tissues or a roll of paper towels. Participants were given one of two questionnaire versions. One questionnaire contained a slightly worse box of facial tissues as a decoy, whereas the other contained a slightly worse roll of paper towels as a decoy. Participants were asked to choose the brand they preferred. Simonson and Tversky report an attraction effect for both paper towels and tissues (t = 1.7 and t = 2.2, respectively; see Table E1).

Attempted Replication

Simonson and Tversky (1992) do not report the brand of paper towels and facial tissues used in their study. To create corresponding stimuli, we conducted a pretest in which 128

Table E1
SIMONSON AND TVERSKY (1992) PAPER TOWEL STUDY RESULTS

Facial Tissue +	*Paper Towel +*	*Facial Tissue –*	*Paper Towel –*
28% $_{32}$	63% $_{72}$	—	10% $_{11}$
42% $_{44}$	52% $_{55}$	7% $_{7}$	—

[10]The sample sizes do not add up to 96 because in the extended set, Sen excluded 18 respondents who chose the decoy. This practice confounds treatment effects with selection effects and is especially problematic when the decoy has substantial choice share. Chen and Risen (2010) discuss a related problem with the interpretation of many cognitive dissonance studies.

participants rated the quality of seven brands of tissues and paper towels that they were allowed to examine and evaluate on a seven-point scale (1 = "low quality," and 7 = "high quality"). Among paper towels, Bounty rated highest (5.52) and Tuf, a Walgreens store brand, rated lowest (2.83). Among facial tissues, Real Soft three-ply tissue rated highest (5.19) and Real Soft two-ply tissue rated lowest (3.50). Thus, we selected Bounty and Real Soft three-ply as our core options, Tuf as our paper towel decoy, and Real Soft two-ply as our facial tissue decoy.

As part of a study they were paid $5 to complete, we randomly assigned 200 students from Yale University to indicate their preference for a set of paper products that they were allowed to examine. Participants were randomly assigned to sample from the core set or from an expanded set with a tissue or paper towel decoy. Presentation order was randomized.

Results and Discussion

Although our study was somewhat underpowered and the results were complicated by nonnegligible fractions choosing the facial tissue decoy, we found little evidence for an attraction effect (see Table E2). Participants chose the high-quality paper towel more frequently when the choice set included the low-quality paper towel decoy (27% vs. 24%), but this difference falls well short of statistical significance ($\chi^2 = .16$, $p = .69$). For the facial tissues, approximately one in four participants chose the decoy, so inferences are limited. There is no violation of regularity (Luce 1959, 1977).

Table E2

RESULTS OF SIMONSON AND TVERSKY (1992) PAPER TOWEL STUDY REPLICATION ATTEMPT

Facial Tissue +	*Paper Towel +*	*Facial Tissue –*	*Paper Towel –*
76% $_{70}$	24% $_{22}$	—	—
66% $_{37}$	13% $_{7}$	21% $_{12}$	—
69% $_{36}$	27% $_{14}$	—	4% $_{2}$

APPENDIX F: ATTEMPT TO REPLICATE TRUEBLOOD ET AL. (2013)

Summary of Original Study

Trueblood et al. (2013) recruited 49 undergraduate students from the University of Newcastle to participate in the study in exchange for course credit. They were required to make a total of 720 judgments about which of three rectangles is largest. For the 540 focal trials, two rectangles were constructed to have identical areas but different dimensions, orientations, and vertical positions on the screen. In these focal trials, the decoy rectangle was presented in the same orientation as the target rectangle but was smaller by virtue of being slightly narrower (180 trials), slightly shorter (180 trials), or both (180 trials). For the trials that included a narrower decoy, the decoy increased the choice share of the target rectangle by approximately 2%, leading to a shift in choice share of approximately 4% when comparing two ternary choice sets with opposing decoys. With the large number of trials, this effect achieved significance ($t(48) = 3.62$, $p < .001$). For the trials that included a shorter decoy, there was no contextual effect ($t(48) = 1.14$, $p > .26$). For trials in which the decoy was both shorter and thinner than the target, there was a small effect that just reached significance ($t(48) = 2.09$, $p < .05$). Between 3% and 4% of participants chose the decoy.

Attempted Replication

We recruited 276 participants from MTurk but restricted our analysis to the 179 who passed an attentional manipulation check (Oppenheimer, Meyvis, and Davidenko 2009) placed at the end of the survey. Our design was similar (but not identical) to that used by Trueblood et al. (2013). We believe there were four main differences: (1) To reduce fatigue, our participants completed only 40 trials; (2) rather than using two ternary choice sets with opposing decoys, we randomly assigned participants to either a control condition (a judgment of which of two differently shaped and oriented rectangles was larger) or a decoy condition (involving those options plus a decoy option that was either narrower or shorter than either the "wider" or the "taller" rectangle); (3) across trials, our rectangles were considerably more variable in both size and shape, though the two "core" rectangles always had the same area; and (4) the lower edges of the rectangles were aligned.

Results and Discussion

We failed to replicate Trueblood et al.'s (2013) results. Table F1 presents our results (subscripts represent choices). Note that although the subscripts should sum to 7,160 (179 participants were each asked to make 40 choices), they sum to 7,117 because 43 items were skipped. We did not exclude anyone for skipping trials, although missing many trials correlated strongly with failing the manipulation check, so many of the respondents who skipped several items were excluded by this criterion.

Table F1

RESULTS OF TRUEBLOOD ET AL. (2013) REPLICATION ATTEMPT

Competitor	*Target*	*Decoy*
53% $_{2,030}$	47% $_{1,810}$	—
51% $_{1,666}$	42% $_{1,363}$	8% $_{248}$

APPENDIX G: ATTEMPT TO REPLICATE RATNESHWAR, SHOCKER, AND STEWART (1987)

Summary of Original Study

Ratneshwar, Shocker, and Stewart (1987) compared preferences between two options with preferences expressed in an expanded choice set that included a third option that was dominated by (or relatively inferior to) one of the two "core" options. For all respondents, quality levels were expressed with numeric indices, but for half of these respondents, the numbers were accompanied by verbal descriptions. For example, the frozen orange juice whose quality was 50 (out of 100) was described as "Medium fresh-orange character mingled with faint processed-orange taste." A second study was similar, except that participants compared the choice share in ternary choice sets involving opposing decoys. In Study 1, the product categories were television sets and frozen orange juice. In Study 2, the categories were beer, cars, lightbulbs, and gas barbecue grills. Participants in Study 1 were 213 undergraduate students at a "southern

state university" in the United States. Participants in Study 2 were 176 undergraduates at a "major private university." The authors found that the attraction effect was often (though not always) reduced when numeric quality ratings were supplemented with verbal descriptions.

Attempted Replication

Using a sample of picnickers near Boston, we attempted to replicate one of Ratneshwar, Shocker, and Stewart's (1987) results. We focused on frozen orange juice with a low-quality decoy because the authors found a large attraction effect using numeric quality ratings but no attraction effect when those numeric quality ratings were supplemented with verbal descriptions. We borrowed these descriptions verbatim to construct our materials. Participants were 275 Boston picnickers who were recruited to fill out a packet of unrelated studies.

Results and Discussion

Table G1 shows the original data and our attempted replication in parentheses. In the numeric condition, we replicated the findings of Ratneshwar, Shocker, and Stewart (1987); adding a decoy orange juice (which was only slightly cheaper, but much lower quality than the target) markedly increased the choice share of the target juice.

Figure G1
RATNESHWAR, SHOCKER, AND STEWART (1987)
REPLICATION ATTEMPT STIMULI

A: Numeric-Only Conditions

Below you will find some brands of frozen concentrated orange juice. You know only the price and the quality ratings made by consumer reports. Given that you had to buy one brand based on this information alone, which would it be? (Circle I or II [or III])

Brand	*Price per Can*	*Quality Rating (100 = Ideal)*
I	$2.00	70
II	$1.20	50
[III	$1.10	30]

B: Numeric with Verbal Conditions

Below you will find some brands of frozen concentrated orange juice. You know only the price and the quality ratings made by consumer reports (100 = perfection).

Brand	*Price per Can*	*Quality Rating*
I	$2.00	70
II	$1.20	50
[III	$1.10	30]

Below you will find some brands of frozen concentrated orange juice. You know only the price and the quality ratings made by consumer reports. Given that you had to buy one brand based on this information alone, which would it be? (Circle I or II [or III])

Detailed description of quality ratings:

Brand I: High fresh-orange character and quite flavorful
Brand II: Medium fresh-orange character mingled with faint processed-orange taste
Brand III: Distinct processed-orange character with slight flavor of fermented oranges

Given that you had to buy one brand based on this information alone, which would it be?

Brand I Brand II [Brand III]

Table G1
RATNESHWAR, SHOCKER, AND STEWART (1987) ORIGINAL DATA AND RESULTS OF REPLICATION ATTEMPT

Attribute Representation	*$2.00 Quality = 70 (Competitor)*	*$1.20 Quality = 50 (Target)*	*$1.10 Quality = 30 (Decoy)*
Numeric	$65\%_{24}$ ($74\%_{51}$)	$35\%_{13}$ ($26\%_{18}$)	—
	$26\%_{9}$ ($43\%_{29}$)	$68\%_{23}$ ($56\%_{38}$)	$6\%_{1}$ ($1\%_{1}$)
Numeric + verbal	$61\%_{22}$ ($86\%_{60}$)	$39\%_{14}$ ($14\%_{10}$)	—
	$68\%_{23}$ ($72\%_{49}$)	$29\%_{10}$ ($26\%_{18}$)	$3\%_{1}$ ($1\%_{1}$)

Notes: Replication results in parentheses.

Unlike their results, we found similar effects when the numeric ratings were supplemented with verbal descriptions: the choice share of the target nearly doubled (from 14% to 26%). We also found a substantial main effect because the verbal descriptions increased the attractiveness of the most expensive brand.

Note that the addition of the decoy option (the low-quality orange juice) not only makes the target a dominating option but also makes it both a compromise option (in attribute space) and a middle option (in physical space). Either of these factors may contribute to or fully explain the effect. The role of middle position could be accounted for by counterbalancing order, which we did not do in this study, and which is not typically done. A problematic feature of this study (as well as our own Studies 3a and 3b) is that the descriptions chosen do not necessarily correspond with those numbers; respondents' interpretation of the quality levels implied by the numbers 70, 50, and 30 is likely affected by the verbal labels. This confounds attribute *representation* (i.e., how quality is communicated) with attribute *levels* (i.e., the perceived quality of the options). Ratneshwar, Shocker, and Stewart (1987, p. 525) note that they conducted a pilot study to "assure that the elaborated product descriptions were perceived as comparable to the purely numeric scale descriptors." However, achieving rough correspondence in the mean levels does not ensure that the two conditions were, in any way, matched at the respondent level, which is what matters.

We conducted a follow-up study with 517 Boston picnickers whom we recruited to fill out a packet of unrelated studies in exchange for ice cream. The study was similar to the prior one, with two key differences: (1) We omitted the numeric ratings of quality and simply provided the price and the verbal quality descriptions, and (2) half the respondents were asked to translate the verbal quality descriptions on a 100-point scale of quality. We did this partly to test whether the presence of numbers—even self-generated numbers—would affect the strength of the attraction effect (as in Study 3c). We report the data in Table G2.

Most notably, we found no evidence of the attraction effect, which is consistent with our other failures to find such effects unless both attributes are numerically specified. The presence of self-generated numbers did not revive the effect. Moreover, returning to an issue we raised previously, although the mean ratings with elaborated descriptions (78, 44, and 21) were tolerably close to the corresponding numeric values used in their study (and in our replication), the alleged correspondence was rarely achieved when the

data are analyzed at the individual level. Indeed, only 10% of our respondents assigned numbers to the verbal descriptions that were within ±10 of the values 70, 50, and 30. This is a reasonably forgiving criterion because triplets such as 80, 40, and 40 or 60, 60, and 20 would count as an acceptable degree of correspondence. This finding starkly illustrates an important drawback of this design (a critique that we acknowledge also applies to our own Studies 3a and 3b).

Figure G2
RATNESHWAR, SHOCKER, AND STEWART (1987)
REPLICATION ATTEMPT FOLLOW-UP STUDY STIMULI

A: Numeric Ratings Omitted

Below you will find some brands of frozen concentrated orange juice. You know only the price and the quality ratings made by consumer reports. Given that you had to buy one brand based on this information alone, which would it be? (Circle I or II) [Circle I, II, or III]

Brand	*Price per Can*
I	$2.00
II	$1.20
[III	$1.10]

Detailed description of quality ratings:

Brand I: High fresh-orange character and quite flavorful
Brand II: Medium fresh-orange character mingled with faint processed-orange taste
[Brand III: Distinct processed-orange character with slight flavor of fermented oranges]

B: Numeric Ratings Self-Generated

Below you will find some brands of frozen concentrated orange juice. You know only the price and the quality ratings made by consumer reports.

Brand	*Price per Can*
I	$2.00
II	$1.20
[III	$1.10]

Detailed description of quality ratings:

Brand I: High fresh-orange character and quite flavorful
Brand II: Medium fresh-orange character mingled with faint processed-orange taste
[Brand III: Distinct processed-orange character with slight flavor of fermented oranges]

On a scale from 0 to 100, how positive are the verbal descriptions above, for each brand? Indicate below.

Brand I = _____ Brand II = _____ [Brand III = _____]

Given that you had to buy one brand based on this information alone, which would it be?

Brand I Brand II [Brand III]

Table G2
RATNESHWAR, SHOCKER, AND STEWART (1987)
REPLICATION ATTEMPT FOLLOW-UP STUDY DATA

Attribute Representation	*$2.00 (Competitor)*	*$1.20 (Target)*	*$1.10 (Decoy)*
Verbal	$74\%_{95}$	$26\%_{23}$	—
	$73\%_{105}$	$22\%_{32}$	$4\%_{6}$
Verbal + own rate	$79\%_{99}$	$21\%_{27}$	—
	$78\%_{100}$	$19\%_{24}$	$4\%_{5}$

Appendix H
STIMULI USED IN STUDIES 1A–1S (EXCLUDING GUSTATORY STIMULI)

A: Apartments

Suppose you are renting an apartment. The following diagrams depict the window views and floor spaces of three options respectively. Which would you choose? (Please circle one.)

A (Area: 530 square feet)

B (Area: 910 square feet)

C (Area: 905 square feet)

Appendix H
CONTINUED

B: Fruit (1)

Suppose you are thinking of having a snack. Which fruit would you choose?

A

B

C

Appendix H
CONTINUED

C: Fruit (2)

Suppose you are thinking of having a snack. Which fruit would you choose?

A

B

C

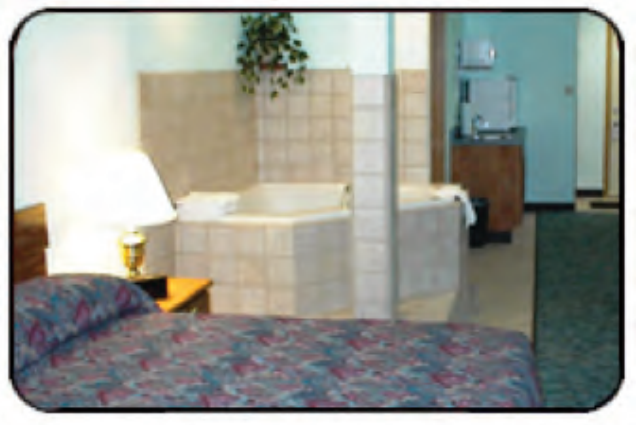
Appendix H
CONTINUED

D: Hotel Rooms

Suppose you are planning a three-day holiday to Los Angeles, California. The following hotels are still available. Which of the following would you choose?

A: $120/night

B: $180/night



C: $180/night

Appendix H
CONTINUED

E: Mints

Suppose you could have one of the products below. Select the one you prefer.

A

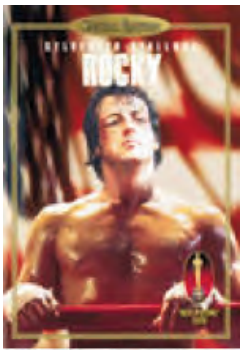
B

C

Appendix H
CONTINUED

F: Movies with Decoy Movie Starring Same Actor as Target Movie (1)

[Suppose] you have just won a free DVD. Please select the one you would like.



Rocky

Sylvester Stallone

"His whole life was a million-to-one shot."

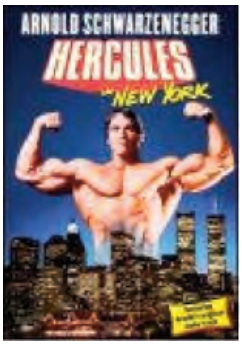
A small time boxer gets a once in a lifetime chance to fight the heavyweight champ in a bout in which he strives to go the distance for his self-respect.

The Terminator

Arnold Schwarzenegger

"In the Year of Darkness, 2029, the rulers of this planet devised the ultimate plan. They would reshape the Future by changing the Past. The plan required something that felt no pity. No pain. No fear. Something unstoppable. They created 'THE TERMINATOR'"

A human-looking, apparently unstoppable cyborg is sent from the future to kill Sarah Connor; Kyle Reese is sent to stop it.



Hercules in New York

Arnold Schwarzenegger

"It's Tremendous!! It's Stupendous!! It's Fun!!"

After many centuries, Hercules gets bored living in Olympus (the home of the great Greek gods) and decides to move to... New York.

Appendix H
CONTINUED

G: Movies with Decoy Movie Starring Same Actor as Target Movie (2)

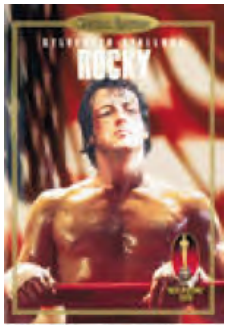
[Suppose] you have just won a free DVD. Please select the one you would like.

The Terminator

Arnold Schwarzenegger

"In the Year of Darkness, 2029, the rulers of this planet devised the ultimate plan. They would reshape the Future by changing the Past. The plan required something that felt no pity. No pain. No fear. Something unstoppable. They created 'THE TERMINATOR'"

A human-looking, apparently unstoppable cyborg is sent from the future to kill Sarah Connor; Kyle Reese is sent to stop it.



Rocky

Sylvester Stallone

"His whole life was a million-to-one shot."

A small time boxer gets a once in a lifetime chance to fight the heavyweight champ in a bout in which he strives to go the distance for his self-respect.

Stop! Or My Mom Will Shoot

Sylvester Stallone

"Detective Joe Bomowski's mom is in town for a visit. She did the laundry, washed the windows and scrubbed the floors. Now, she's gonna clean up the streets."

A tough detective's mother comes to visit him and begins to meddle in his life and career.

Appendix H
CONTINUED

H: Movies with Decoy Movie Bad Sequel to Target Movie (1)

[Suppose] you have just won a free DVD. Please select the one you would like.

Speed

A young cop must save the passengers of a bus that has a bomb set to explode if the bus goes below 50 MPH.

"Get ready for rush hour."

Grease

The friendships, romances, and adventures of a group of high school kids in the 1950s

"Grease is the word"

Grease 2

An English student at a 1960s American high school has to prove himself to the leader of a girls' gang whose members can only date greasers.

"Grease is still the word!"

Appendix H
CONTINUED

I: Movies with Decoy Movie Bad Sequel to Target Movie (2)

[Suppose] you have just won a free DVD. Please select the one you would like.

Grease

The friendships, romances, and adventures of a group of high school kids in the 1950s

"Grease is the word"

Speed

A young cop must save the passengers of a bus that has a bomb set to explode if the bus goes below 50 MPH.

"Get ready for rush hour."

Speed 2

A computer hacker breaks into the computer system of the Seaborn Legend cruise liner and sets it speeding on a collision course into a gigantic oil tanker.

"Rush hour hits the water"

Appendix H
CONTINUED

J: Popcorn (1)

Suppose you could have one of the products below. Select the one you prefer.

A

B

C

Appendix H
CONTINUED

K: Popcorn (2)

Suppose you could have one of the products below. Select the one you prefer.

A

B

C

Appendix H
CONTINUED

L: Bottled Water

Suppose you could have one of the products below. Select the one you prefer.

APPENDIX I: ADDITIONAL STUDY ON IMAGE QUALITY AND DOWNLOAD TIMES

Method

We recruited a total of 1,288 participants from MTurk and Yale University's eLab but restricted analysis to 1,088 respondents who passed an instructional manipulation check. Participants were asked to select servers they would use for the study under the pretense that the study would involve downloading photographs to rate. The servers varied in terms of image quality (480p or 1080p) and download time (10, 20, or 14 seconds). The core set consisted of a high-resolution (1080p) photo that downloaded slowly (20 seconds) or a lower-resolution (480p) photo that downloaded more quickly (10 seconds). The decoy option was a low-resolution (480p) photo that downloaded in 14 seconds.

We manipulated how image resolution and download time were represented. Image quality was represented either visually (as shown in Figure I1), numerically (1080p or 480p), or both (the numeric metric of quality was printed next to the picture). Similarly, download time was depicted by a progress bar (which participates saw gradually being filled), by the number of seconds that were required (20, 10, or 14), or both (respondents experienced the duration of the depicted number of seconds). Table I1 lists the six experimental variations. Figure I1 displays the case in which both dimensions were experienced. We found no significant attraction effect in any of the six studies, nor when these studies were pooled.

Figure I1
IMAGE QUALITY REPRESENTED VISUALLY

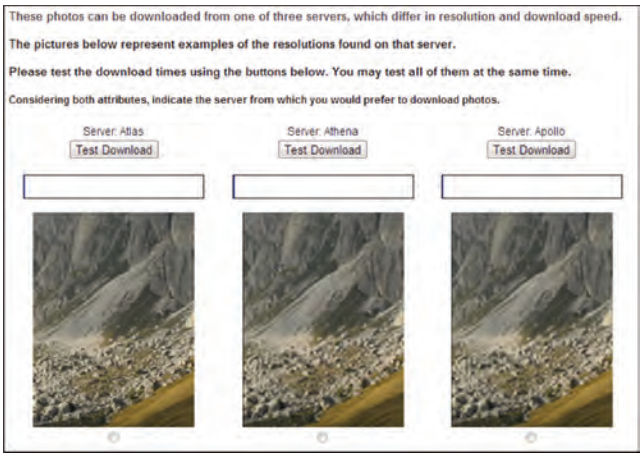


Table I1
SIX EXPERIMENTAL VARIATIONS

Experimental Variation	*Representation*	*1080p 20 Seconds (Competitor)*	*480p 10 Seconds (Target)*	*480p 14 Seconds (Decoy)*
1	Duration quantified	57% $_{54}$	43% $_{41}$	—
	Image quality quantified	42% $_{44}$	51% $_{54}$	7% $_{7}$
2	Duration experienced	33% $_{29}$	67% $_{58}$	—
	Image quality quantified	38% $_{33}$	46% $_{40}$	16% $_{14}$
3	Duration experienced and quantified	43% $_{40}$	57% $_{53}$	—
	Image quality quantified	38% $_{28}$	58% $_{43}$	4% $_{3}$
4	Duration quantified	79% $_{78}$	21% $_{21}$	—
	Image quality experienced	65% $_{55}$	29% $_{24}$	6% $_{5}$
5	Duration quantified	76% $_{71}$	24% $_{22}$	—
	Image quality experienced and quantified	72% $_{63}$	20% $_{17}$	8% $_{7}$
6	Duration experienced	67% $_{68}$	33% $_{34}$	—
	Image quality experienced	49% $_{40}$	45% $_{37}$	6% $_{5}$
	Pooled across conditions	60% $_{340}$	40% $_{229}$	—
		51% $_{263}$	41% $_{215}$	8% $_{41}$