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Opportunity Cost Neglect Attenuates the Effect of Choices on Preferences

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Abstract

The idea that choices alter preferences has been widely studied in psychology, yet prior research has focused primarily on choices for which all alternatives were salient at the time of choice. Opportunity costs capture the value of the best forgone alternative and should be considered as part of any decision process, yet people often neglect them. How does the salience of opportunity costs at the time of choice influence subsequent evaluations of chosen and forgone options? In three experiments, we found that there was a larger postchoice spread between evaluations of focal options and opportunity costs when opportunity costs were explicit at the time of choice than when they remained implicit.

Keywords

opportunity costs, choices, preferences, open data, open materials

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People make myriad choices every day. They decide whether to have whole milk or skim milk in their lattes and whether to head to the movies or stay home. Making choices affects their preferences (Brehm, 1956). Choosing whole milk strengthens preferences for whole milk over skim milk. Choosing movies strengthens preferences for seeing movies over staying home. Yet these same choices may be represented differently. People could instead decide whether to have whole milk or not and whether to watch movies or not. We showed in three experiments that using these whether-or-not choice frames attenuated the effect of choices on preferences for implied alternatives.

Choices Affect Preferences

The relationship between preferences and choices is bidirectional: Preferences shape choices, and choices shape preferences. Postchoice preferences shift to favor chosen alternatives (Ariely & Norton, 2008; Bem, 1967; Brehm, 1956; Sharot, Fleming, Yu, Koster, & Dolan, 2012; Sharot, Velasquez, & Dolan, 2010). This effect is multiply determined. Cognitive dissonance posits that choices create dissonance that is reduced by devaluing forgone alternatives and enhancing chosen alternatives (Brehm, 1956; Festinger, 1957). Self-perception theory posits that people learn their preferences by observing their choices (Bem, 1967). Constraint satisfaction posits that preferences are shaped during choices to make decisions easier (Simon, Krawczyk, & Holyoak, 2004). We study the conditions under which choices affect preferences but do not empirically differentiate among these processes.

Choices must be perceived as such to affect preferences (e.g., Linder, Cooper, & Jones, 1967; Sharot et al., 2010), so formally equivalent choice frames can differentially affect preferences. People are more sensitive to a feature's presence than to its absence (Newman, Wolff, & Hearst, 1980), so choosing one alternative changes its evaluation more than not rejecting a complementary alternative does (Allison & Messick, 1988; Cioffi & Garner, 1996; Fazio, Sherman, & Herr, 1982).

Neglected Opportunity Costs

All choices involve forgone alternatives. Having whole milk means not having skim milk. Going to the movies means not staying home. The value of the best forgone

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alternative is the opportunity cost of the chosen alternative. Although normative models of decision making suggest that people should always consider opportunity costs, they often fail to do so (Frederick, Novemsky, Wang, Dhar, & Nowlis, 2009; Jones, Frisch, Yurak, & Kim, 1998; Legrenzi, Girotto, & Johnson-Laird, 1993; Magen, Dweck, & Gross, 2008; Northcraft & Neale, 1986). When people neglect opportunity costs, they fail to recognize that the choice is from among multiple options. When opportunity costs are made explicit, whether-or-not decisions transform into which-one decisions.

Because choices affect preferences only when they are perceived as choices, we propose that when people consider opportunity costs, choosing causes preferences to shift to favor chosen options over forgone options; when people neglect opportunity costs, these shifts are attenuated. Although many choices are whether-or-not decisions, to our knowledge, the differential effect of whether-or-not and which-one representations on preferences for implied opportunity costs has not been tested.[1]

Experiment 1

We first sought to establish the moderating effect of considering opportunity costs via an experiment with three phases: prechoice evaluations, choice, and postchoice evaluations. Participants made a choice in the presence or absence of explicit cues about opportunity costs.

Method

Participants. Participants recruited from Amazon Mechanical Turk ($N = 101$; 47% female; mean age = 37.11 years) completed the study online in exchange for a small payment. The target sample size (100) was determined before data collection began; 1 additional respondent completed the study without collecting payment.

Design. Participants were randomly assigned to one of two conditions in which opportunity costs were either explicit or implicit at the time of choice. There were three phases in the study: prechoice evaluations, choice, and postchoice evaluations. We examined choice-induced preferences by comparing how the difference between postchoice evaluations of focal options and opportunity costs varied depending on choice, controlling for the difference in prechoice evaluations. If choice does not affect preferences, differences in postchoice evaluations should be predicted by differences in prechoice evaluations but should not be predicted by choice. We address the alternative explanation of revealed preferences in all Results sections and in Experiment 3.

Materials and procedure. We assessed prechoice evaluations by asking participants to imagine that they were eligible to receive different independent offers as part of a marketing promotion (e.g., "2 nights in a luxury hotel"). Participants used a 7-point scale (1 = *not at all*, 7 = *very much*) to rate how much they would like each of 11 such offers. One of these (a $100 Visa gift card) would be the option that represented the opportunity cost at the time of choice and was either the first offer or the last offer to be evaluated; order was counterbalanced across participants.

After completing the prechoice evaluations, participants were asked to imagine that they had accumulated 50,000 airline miles and that their miles would expire soon. If they did not spend their miles before the miles expired, the airline would send them a $100 Visa gift card. Participants decided whether to spend their airline miles on each of 10 focal offers (e.g., "Spend my miles on 2 nights in a luxury hotel").[2] Each option was presented as an independent decision, and participants were instructed to treat each decision as though it were their only opportunity to spend their miles before they expired. As a result, the 10 focal offers competed not with one another but only with the opportunity cost (i.e., the $100 Visa gift card).

Participants assigned to the implicit condition made choices between accepting the focal options (e.g., "Spend my miles on 2 nights in a luxury hotel") or rejecting the focal options (e.g., "Do not spend my miles on 2 nights in a luxury hotel"); this frame made opportunity costs implicit. Participants assigned to the explicit condition made choices between accepting the focal options or rejecting the focal options in favor of the explicit opportunity cost instead (e.g., "Do not spend my miles on 2 nights in a luxury hotel and take the $100 Visa gift card instead"; Frederick et al., 2009). The two frames are formally equivalent.

Postchoice evaluations were assessed by asking participants again to rate the desirability of each of the 11 prechoice offers, using a method identical to that used in the prechoice evaluations. The order in which the opportunity cost was presented was counterbalanced. At the top of the survey screen, participants saw the full list of 10 choices they had made (e.g., "Given the choice of: [focal option], or [nonfocal option], you chose: [chosen option]"). The wording was consistent with the manipulation: The description of the nonfocal option included the phrase "and take the $100 Visa gift card instead" only for participants in the explicit condition.

Finally, participants reported what they thought would happen to their miles if they decided not to spend them, completed an attention check, and reported their sex and age.

Results

We calculated prechoice and postchoice differences (spreads) between evaluations of focal options (averaged across the 10 offers) and the opportunity cost (the $100 Visa gift card). Spread could take values from −6 to 6. The proportion of participants who were able to identify what

would happen if their miles expired (as indicated by the inclusion of "100," "Visa," "gift," or "card" in their open-ended report) did not vary by condition, $\chi^2(1, N = 101) < 1, p > .9$.

To test whether consideration of explicit opportunity costs shifts preferences, we regressed postchoice spread on condition (1 = explicit, −1 = implicit), proportion of focal offers chosen (from 0, all rejected, to 1, all accepted), and their interaction (the effect of interest), controlling for prechoice spread.

Table 1 reports full regression results and simple effects. The test of interest is the interaction. Controlling for prechoice spread, the degree to which postchoice spread varied with the proportion of options chosen depended on whether opportunity costs were explicit at the time of choice. When opportunity costs were explicit, the postchoice spread increased with the proportion of focal options chosen. However, when opportunity costs were implicit, the proportion of focal options a participant chose was unrelated to the postchoice spread. This difference in slopes was driven by evaluations of the opportunity cost rather than evaluations of the focal options. The simple slope was unexpectedly positive when opportunity costs were implicit but trended negative, as expected, when opportunity costs were explicit. Figure 1 depicts simple slopes for evaluations of focal options and opportunity costs in each condition.

Chen and Risen (2010) proposed that in some cases, measurement error may lead to an apparent shift in preferences. Prechoice evaluations, postchoice evaluations, and choices may each be noisy measures of the same construct (true preferences). If postchoice evaluations are regressed on choice and prechoice evaluations, any apparent effect of choice may be due merely to measurement error in prechoice evaluations. If postchoice and prechoice evaluations are simply two noisy measures of the same underlying construct, then the effect should persist if we swap them and use prechoice spread as the dependent variable and postchoice spread as the covariate. The effect did not persist, interaction $b = -0.173$, $SE = 0.392$, $t(96) = -0.442$, $p = .659$.

Experiment 2

Neglecting opportunity costs attenuated the effect of choices on preferences. In Experiment 2, we aimed to separate consideration at choice from consideration at evaluation.

Method

Participants. Participants recruited from Amazon Mechanical Turk ($N = 400$; 35% female; mean age = 31.28 years) completed the study online in exchange for a small payment. Sample size was determined before data collection began.

Design. In Experiment 2, we used a 2 (opportunity costs at choice: explicit, implicit) × 2 (opportunity costs

Table 1. Experiment 1 Results: Full Regression Results and Simple Effects

Analysis and predictor	*b*	*SE*	*t*(96)	*p*
Primary analysis predicting postchoice spread				
Intercept	–0.904	0.265	–3.411	< .001
Prechoice spread	0.812	0.083	9.831	< .001
Proportion of focal options chosen[a]	1.029	0.440	2.341	.021
Opportunity costs[b]	–0.520	0.216	–2.407	.018
Opportunity Costs × Proportion Chosen	1.011	0.438	2.310	.023
Simple effects on postchoice spread				
Proportion chosen (explicit condition)	2.040	0.720	2.832	.006
Proportion chosen (implicit condition)	0.018	0.501	0.036	.971
Simple effects on evaluation of the focal option[c]				
Proportion chosen (explicit condition)	1.250	0.466	2.679	.009
Proportion chosen (implicit condition)	1.570	0.332	4.730	< .001
Simple effects on evaluation of opportunity costs[c]				
Proportion chosen (explicit condition)	–0.813	0.629	–1.294	.199
Proportion chosen (implicit condition)	1.622	0.443	3.661	< .001

[a]Proportion of focal options chosen (referred to as "proportion chosen" elsewhere in the table) could take a value from 0 to 1 and did not vary between conditions (explicit condition: $M = .446$, $SD = .165$; implicit condition: $M = .482$, $SD = .239$), $t(99) = 0.873$, $p = .385$. [b]Opportunity costs were coded as 1 for explicit and −1 for implicit. Because of the interaction term, the estimate of the effect of opportunity costs was not the main effect, but rather the simple effect estimated when the proportion chosen was equal to 0. [c]In all simple-effects analyses of evaluations of postchoice focal options and opportunity costs, only the corresponding prechoice evaluation, not the prechoice spread, was included as a covariate.

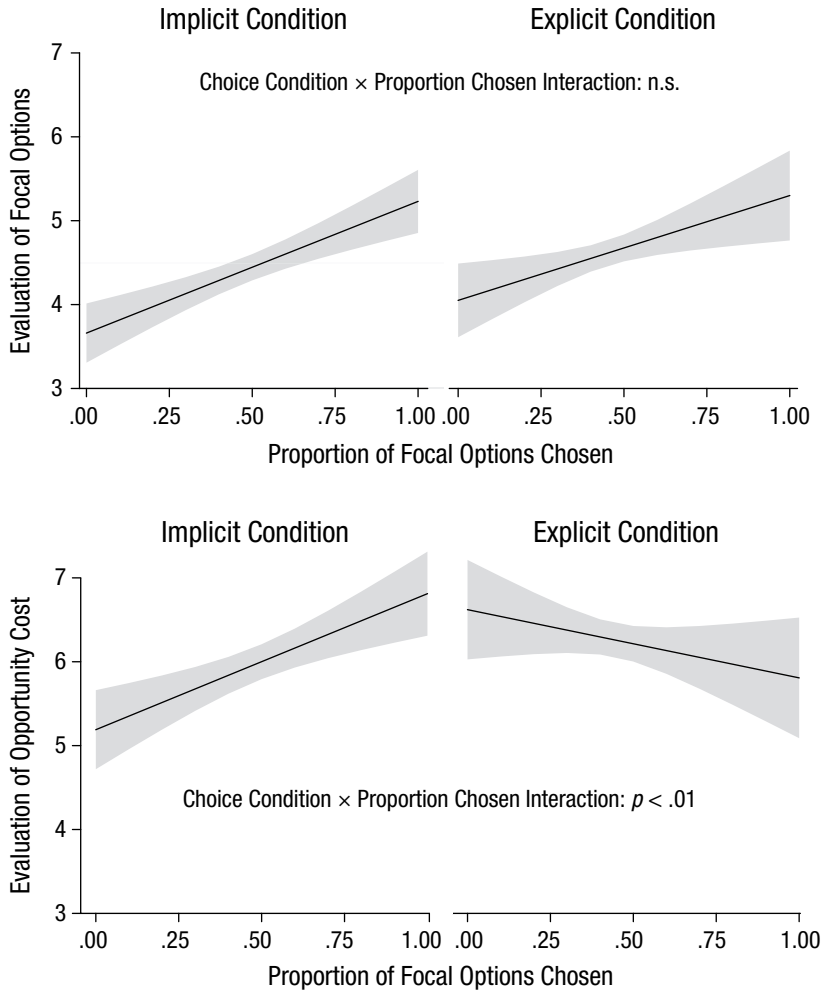

Fig. 1. Results from Experiment 1: relationship between proportion of focal options chosen and postchoice evaluations of focal options (top) and opportunity costs (bottom), after controlling for prechoice evaluations. Results are presented separately by condition. The gray shading around the line in each graph indicates the 95% confidence interval.

at postchoice: explicit, implicit) experimental design. In Experiment 1, participants saw reminders of their choices when making their second set of evaluations. For a given participant, the presence or absence of opportunity costs was the same during choice and during the postchoice evaluations. By contrast, in Experiment 2, the salience of the opportunity costs was manipulated separately at the time of choice and at the postchoice evaluations. Participants in the explicit-choice condition saw explicit opportunity costs at the time of choice; those in the implicit-choice condition did not. Participants in the explicit-postchoice conditions saw explicit opportunity costs at postchoice evaluations (regardless of whether they saw them at the time of choice); those in the implicit-postchoice condition did not.

Materials and procedure. Except for the manipulation of salience during the postchoice evaluations, the materials and procedure of Experiment 2 were nearly identical to those of Experiment 1. There were two other changes: (a) Prechoice and postchoice evaluations of each of the 11 offers were elicited using nonnumerical sliders (ranging from 0 to 100, though numbers were not displayed) anchored by *not at all desirable* and *extremely desirable*, and (b) one focal option from Experiment 1 (a $200 Amazon gift card) was chosen by nearly every participant, so we made that option less desirable in Experiment 2 (by decreasing its face value to $150) to increase variation in proportion chosen.

Results

Prechoice and postchoice spreads (with a possible range of −100 to 100) were calculated as in Experiment 1. To test whether the effect of opportunity cost consideration on spread was driven by the salience of opportunity

Table 2. Experiment 2 Results: Full Regression Results and Simple Effects

Analysis and predictor	*b*	*SE*	*t*(391)	*p*
Primary analysis predicting postchoice spread				
Intercept	–20.476	2.476	–8.269	< .001
Prechoice spread	0.639	0.038	16.708	< .001
Proportion of focal options chosen[a]	21.819	4.022	5.424	< .001
Choice condition[b,c]	–8.414	1.941	–4.334	< .001
Postchoice condition[c,d]	–0.264	1.929	–0.137	.891
Choice × Proportion Chosen	14.529	3.820	3.804	< .001
Postchoice × Proportion Chosen	–0.680	3.786	–0.179	.858
Choice × Postchoice[c]	1.815	1.927	0.942	.347
Choice × Postchoice × Proportion Chosen	–2.554	3.780	–0.676	.500
Simple effects on postchoice spread				
Proportion chosen (explicit-choice condition)	36.348	6.054	6.004	< .001
Proportion chosen (implicit-choice condition)	7.290	4.989	1.461	.145
Simple effects on evaluation of the focal option[e]				
Proportion chosen (explicit-choice condition)	17.794	3.740	4.758	< .001
Proportion chosen (implicit-choice condition)	26.770	3.165	8.457	< .001
Simple effects on evaluation of opportunity costs[e]				
Proportion chosen (explicit-choice condition)	–16.964	6.035	–2.811	.005
Proportion chosen (implicit-choice condition)	19.957	5.203	3.835	< .001

[a]Proportion of focal options chosen (referred to as "proportion chosen" elsewhere in the table) could take a value from 0 to 1; as in Frederick, Novemsky, Wang, Dhar, and Nowlis (2009), it was lower when opportunity costs were explicit at the time of choice (M = .435, SD = .185) than when they were implicit (M = .519, SD = .222), $t(398) = 4.104$, $p < .001$. [b]Choice condition was coded as 1 for explicit and –1 for implicit. [c]Because of the interactions with proportion chosen, these rows represent the simple effect or simple interaction estimated when the proportion chosen was equal to 0. [d]Postchoice condition was coded as 1 for explicit and –1 for implicit. [e]In all simple-effects analyses of evaluations of postchoice focal options and opportunity costs, only the corresponding prechoice evaluation, not the prechoice spread, was included as a covariate.

costs at the time of choice or at the time of evaluations, we regressed postchoice spread on proportion of offers chosen (0 to 1), choice condition (1 = explicit, –1 = implicit), postchoice condition (1 = explicit, –1 = implicit), and all two- and three-way interactions, controlling for prechoice spread.

In Experiment 1, the manipulations of salience during choice and postchoice were confounded; these effects were separable in Experiment 2. Table 2 reports full regression results. When opportunity costs were explicit at the time of choice, the postchoice spread increased with the proportion of focal options chosen. This relationship was significantly attenuated (and in fact eliminated) when opportunity costs were implicit at the time of choice. It made no difference whether opportunity costs were explicit during postchoice evaluations. As in Experiment 1, the effect of the salience of opportunity costs was driven by evaluations of opportunity costs rather than by evaluations of focal options; the slope for opportunity costs was again positive for the implicit-choice condition and negative for the explicit-choice condition. Figure 2 depicts simple slopes for evaluations of focal options and opportunity costs in each condition. As in Experiment 1, Chen and Risen's (2010) critique cannot account for the results; the interaction effect was eliminated when prechoice and postchoice evaluations were swapped, $b = -0.911$, $SE = 3.926$, $t(391) = -0.232$, $p = .817$.

Unlike participants in Experiment 1, participants in the explicit-choice condition were more likely than those participants in the implicit-choice condition to correctly recall the opportunity cost at the end of the study (as assessed using the same criteria as in Experiment 1: 78% vs. 65%; $z = 2.788$, $p = .005$), but this cannot account for the results. The interactive effect of choice condition and proportion chosen on postchoice spread was replicated among the subset of participants who correctly recalled the opportunity cost—Proportion Chosen × Choice Condition: $b = 13.398$, $SE = 4.839$, $t(278) = 2.768$, $p = .006$; Proportion Chosen × Postchoice Condition: $b = 4.106$, $SE = 4.835$, $t(278) = 0.849$, $p = .396$.

Experiment 3

In Experiments 1 and 2, choices had a greater effect on preferences when opportunity costs were explicit than when they were implicit. We hypothesize that these results were not due to revealed preferences. In Experiment 3, we tested whether revealed preferences

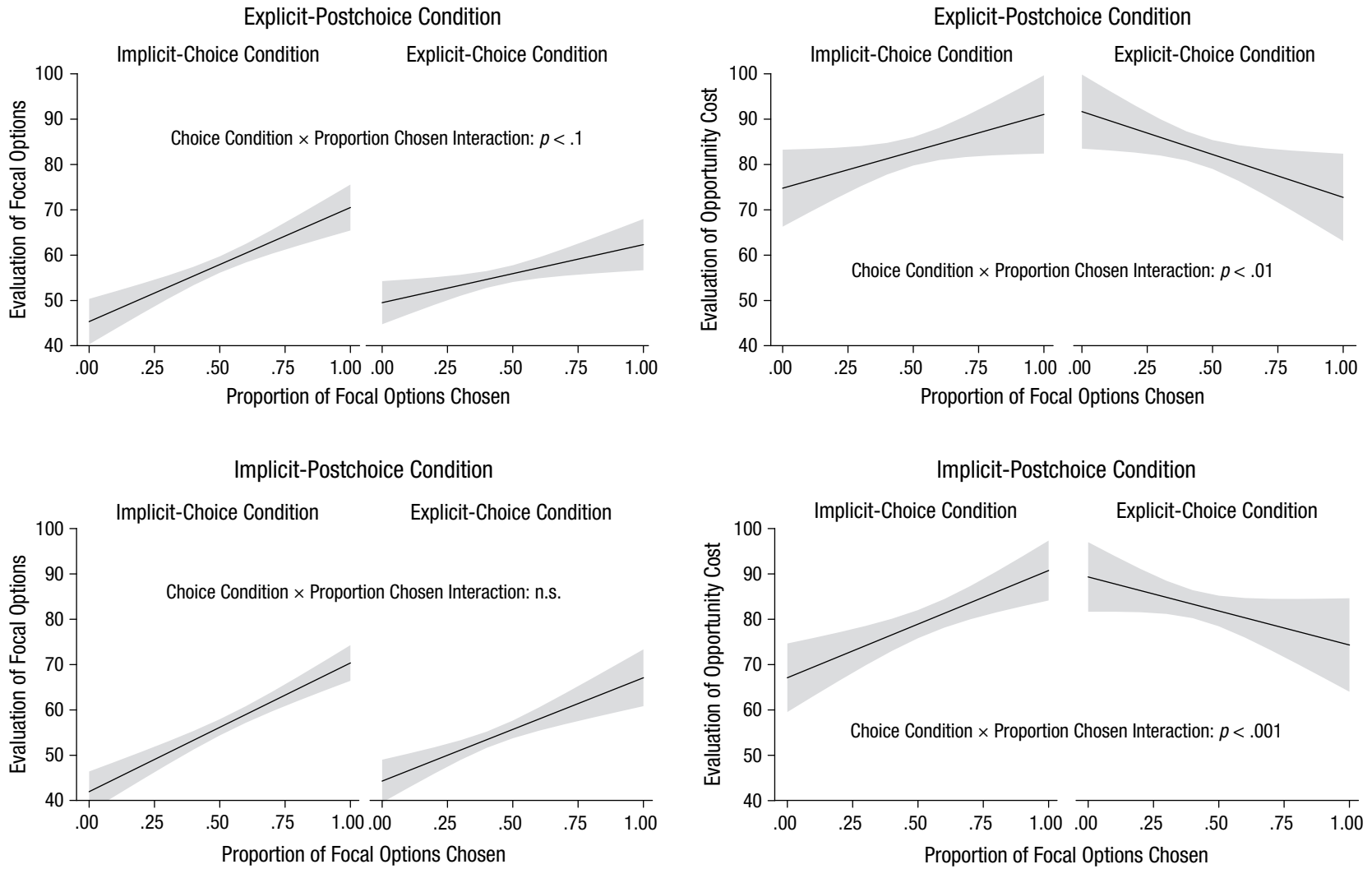

Fig. 2. Results from Experiment 2: relationship between proportion of focal options chosen and postchoice evaluations of focal options (left) and opportunity costs (right), after controlling for prechoice evaluations. Results are presented separately by condition. The gray shading around the line in each graph indicates the 95% confidence interval.

Table 3. Key Questions and Comparisons to Test Choice-Induced Preferences Against Revealed Preferences as Explanations in Experiment 3

Key question	Predicted relative slope magnitudes	
	If choices affect preferences	If choices merely reveal preferences
1. When choices precede preference measurements, does the salience of opportunity costs matter?	Explicit RCR condition > implicit RCR condition	Explicit RCR condition > implicit RCR condition
2. When opportunity costs are explicit, does order of choices matter?	Explicit RCR condition > explicit RRC condition	Explicit RCR condition = explicit RRC condition
3. When choices follow preference measurements, does the salience of opportunity costs matter?	Explicit RRC condition = implicit RRC condition	Explicit RRC condition > implicit RRC condition

Note: RCR = rate-choose-rate; RRC = rate-rate-choose.

could explain the relationship between choices and preferences by manipulating whether choices preceded or followed evaluations. If choices merely revealed preferences, the relationship would be the same whether choices preceded or followed evaluations. If choices affected preferences, the relationship would only hold if choices preceded evaluations.[3]

Method

Participants. Participants recruited from Amazon Mechanical Turk (N = 1,007; 49% female; mean age = 33.72 years) completed the study online in exchange for a small payment. The target sample size (1,000) was determined before data collection began; 7 additional unique respondents completed the study without collecting payment.

Design. In this study, we eliminated the postchoice manipulation from Experiment 2 and manipulated order of choice using a 2 (opportunity costs at choice: explicit, implicit) × 2 (order of choice: rate-choose-rate, or RCR; rate-rate-choose, or RRC) between-subjects design. The first of these factors was exactly as in Experiment 2. For the second factor, we varied the order of tasks. The design of the RCR condition was similar to that of Experiments 1 and 2: Participants evaluated all options, then made target choices, then evaluated all options again; however, these tasks were followed by a set of filler choices, unlike the procedure in Experiments 1 and 2. In the RRC condition, the position of the two choice tasks was reversed: Participants evaluated all options, then completed a set of filler choices, then evaluated all options again, and finally made their target choices.

Materials and procedure. This experiment was identical to Experiment 2 except for the following changes: (a) We manipulated the order of choice; (b) no choice information was displayed during the second set of evaluations; (c) participants completed 10 filler choices regarding how to spend time on an unexpected afternoon off (e.g., "Read in a coffee shop" vs. "Not read in a coffee shop"); (d) minor wording changes were made to the instructions, including noting that the second set of evaluations was not a memory test; and (e) the estimated duration of the experiment was longer, and participants were paid more.

Results

Varying the order of the tasks allowed us to answer three key questions of interest through the use of three different comparisons, as shown in Table 3. Together, the answers to these three questions allowed us to address whether our findings were, in fact, driven by choice-induced preferences or by preferences that were simply revealed by choices. The first key question was whether we had replicated our results from Experiments 1 and 2. If so, the first key comparison would show that for the RCR condition, the coefficient for proportion chosen was larger when opportunity costs were explicit than when they were implicit. The second key question was whether when opportunity costs were explicit, choices influenced preferences and did not merely reveal them. If so, the second key comparison would show that when opportunity costs were explicit, the coefficient for proportion chosen was larger for the RCR condition than for the RRC condition. The third key question was whether choices revealed preferences more strongly when opportunity costs were explicit than when they were implicit. If so, the third key comparison would show that for the RRC condition, the coefficient for proportion chosen was larger when opportunity costs were explicit than when they were implicit. Full regression results and simple effects are given in Table 4.[4] Key comparisons were tested by the interactions of proportion chosen with each contrast.

Table 4. Experiment 3 Results: Full Regression Results and Simple Effects

Analysis and predictor	*b*	*SE*	*t*(984)[a]	*p*
Primary analysis predicting postchoice spread				
Intercept	–13.029	1.308	–9.962	< .001
Prechoice spread	0.809	0.020	41.139	< .001
Proportion of focal options chosen[b]	13.574	2.048	6.628	< .001
Contrast 1 (explicit RCR condition vs. implicit RCR condition)[c,d]	–4.710	2.683	–1.755	.080
Contrast 2 (explicit RCR condition vs. explicit RRC condition)[c,e]	–10.217	2.755	–3.709	< .001
Contrast 3 (explicit RRC condition vs. implicit RRC condition)[c,f]	–2.420	2.764	–0.876	.381
Contrast 1 × Proportion Chosen	13.122	5.219	2.514	.012
Contrast 2 × Proportion Chosen	19.507	5.692	3.427	< .001
Contrast 3 × Proportion Chosen	5.882	5.363	1.097	.273
Simple effects on postchoice spread				
Proportion chosen (explicit RCR condition)	28.079	4.173	6.729	< .001
Proportion chosen (implicit RCR condition)	14.957	3.356	4.457	< .001
Proportion chosen (explicit RRC condition)	8.572	4.131	2.075	.038
Proportion chosen (implicit RRC condition)	2.690	3.602	0.747	.455
Simple effects on evaluation of the focal option[g]				
Proportion chosen (explicit RCR condition)	13.949	2.361	5.909	< .001
Proportion chosen (implicit RCR condition)	15.264	1.922	7.940	< .001
Proportion chosen (explicit RRC condition)	5.204	2.327	2.237	.026
Proportion chosen (implicit RRC condition)	2.594	2.059	1.260	.208
Simple effects on evaluation of opportunity costs[g]				
Proportion chosen (explicit RCR condition)	–11.547	3.624	–3.186	.001
Proportion chosen (implicit RCR condition)	2.235	2.928	0.763	.445
Proportion chosen (explicit RRC condition)	–0.899	3.596	–0.250	.803
Proportion chosen (implicit RRC condition)	1.564	3.166	0.494	.621

Note: RCR = rate-choose-rate; RRC = rate-rate-choose.
[a]Degrees of freedom were 984 (not 998) because of missing observations. [b]Proportion of focal options chosen (referred to as "proportion chosen" elsewhere in the table) could take a value from 0 to 1; as in Frederick, Novemsky, Wang, Dhar, and Nowlis (2009), it was lower when opportunity costs were explicit (M = .448, SD = .187) than when they were implicit (M = .511, SD = .222), $t(1005) = 4.898$, $p < .001$. [c]Because of the interactions with proportion chosen, these rows represent the simple effect estimated when the proportion chosen was equal to 0. [d]Contrast 1 was coded as –0.75 for the implicit RCR condition and 0.25 otherwise. [e]Contrast 2 was coded as 0.5 for RCR and –0.5 for RRC. [f]Contrast 3 was coded as –0.75 for the implicit RRC condition and 0.25 otherwise. [g]In all simple-effects analyses of evaluations of postchoice focal options and opportunity costs, only the corresponding prechoice evaluation, not the prechoice spread, was included as a covariate.

These results were inconsistent with the explanation that the observed effects were due merely to revealed preferences; however, they were consistent with the explanation that choices affected preferences to a greater extent when opportunity costs were explicit. As in Experiments 1 and 2, when choices preceded evaluations (i.e., the RCR conditions), the effect of choices on preferences was greater when opportunity costs were explicit than when they were implicit (Contrast 1 × Proportion Chosen), even when choices were not shown at the time of postchoice evaluations. This effect cannot be due to revealed preferences (Contrast 2 × Proportion Chosen) because the slope when opportunity costs are salient and choices follow evaluations (explicit RRC condition) is significantly smaller than when opportunity costs are salient and choices precede evaluations (explicit RCR condition). Furthermore, there is no evidence that explicit opportunity costs moderate the relationship between choices and the second set of evaluations when choices follow evaluations (Contrast 3 × Proportion Chosen).[5]

As in Experiments 1 and 2, the effect of the salience of opportunity costs was driven by evaluations of the opportunity costs rather than evaluations of the focal options, and when choices preceded ratings, the simple slope on proportion chosen when opportunity costs were explicit was negative. In contrast to Experiments 1 and 2, the simple slope on proportion chosen when opportunity costs were implicit was nearly 0. Given the greater power of Experiment 3, we hesitate to draw strong conclusions from the positive slope observed in the implicit conditions in Experiments 1 and 2. It is possible that the display of choices at the time of evaluation (which was removed in Experiment 3) had a main effect on the relationship between proportion chosen and evaluations of opportunity costs. Figure 3 depicts simple slopes for

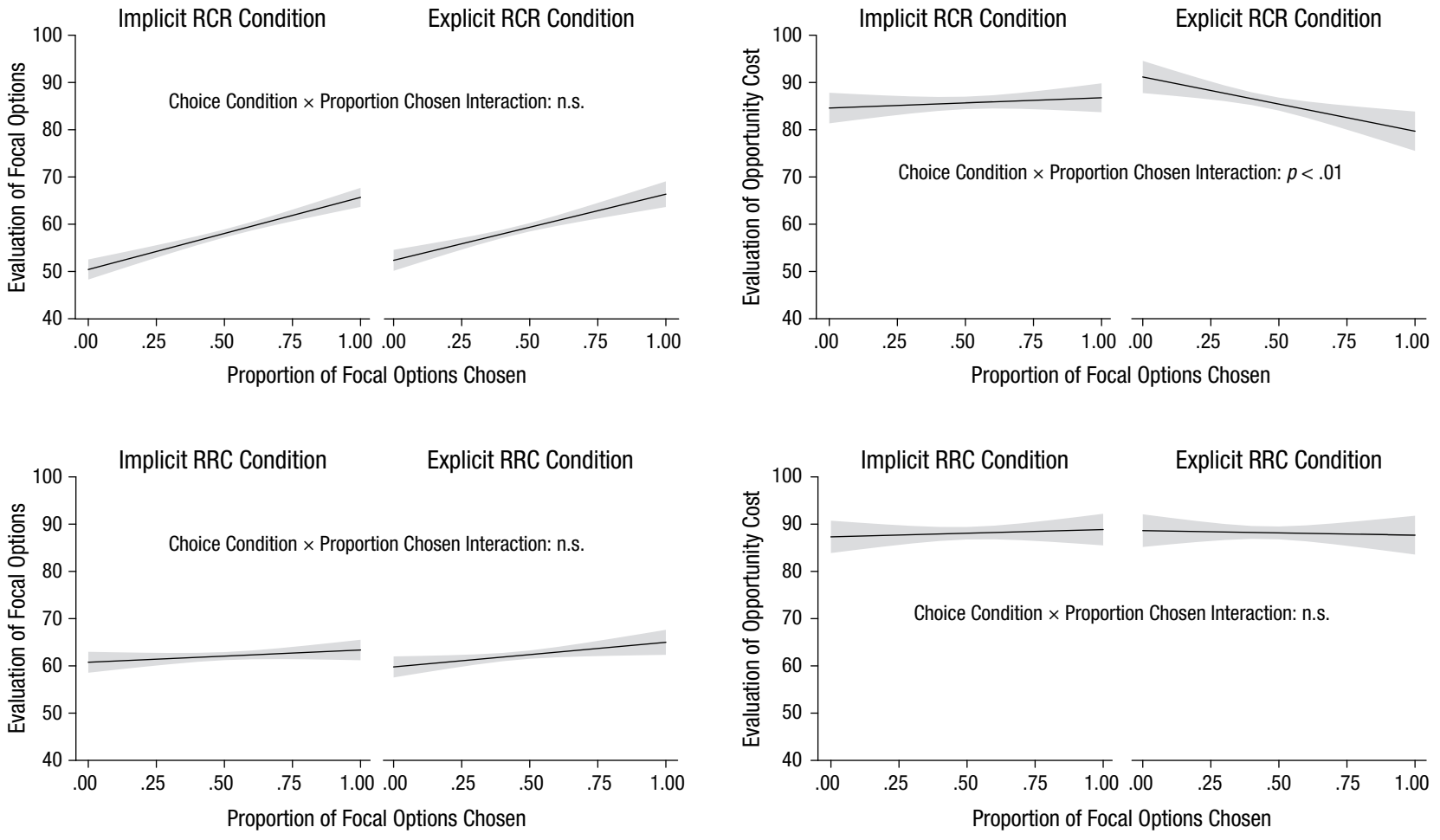

Fig. 3. Results from Experiment 3: relationship between proportion of focal options chosen and postchoice evaluations of focal options (left) and opportunity costs (right), after controlling for prechoice evaluations. Results are presented separately by condition. The gray shading around the line in each graph indicates the 95% confidence interval. RCR = rate-choose-rate; RRC = rate-rate-choose.

evaluations of focal options and opportunity costs in each condition.

As in Experiment 2, we conducted a set of robustness checks. The interaction between proportion chosen and opportunity costs within the RCR conditions was no longer significant when we swapped the prechoice and postchoice spreads—Contrast 1 × Proportion Chosen: $b = -4.297$, $SE = 5.147$, $t(984) = -0.835$, $p = .404$. The interaction between proportion chosen and opportunity costs within the RRC conditions remained nonsignificant—Contrast 3 × Proportion Chosen: $b = 2.675$, $SE = 5.277$, $t(984) = 0.507$, $p = .612$. Surprisingly, there was a significant interaction between proportion chosen and order within the explicit condition—Contrast 2 × Proportion Chosen: $b = -15.149$, $SE = 5.610$, $t(984) = -2.700$, $p = .007$. This interaction revealed a significant relationship between proportion chosen and prechoice spread for the explicit RRC condition, $b = 12.322$, $SE = 4.053$, $t(984) = 3.041$, $p = .002$, but not for the explicit RCR condition, $b = -2.827$, $SE = 4.196$, $t(984) = -0.674$, $p = .501$. Although there was some evidence that choices revealed prechoice preferences within the RRC conditions, there was no such evidence within the RCR conditions. Even within the RRC conditions, preference revelation did not depend on the salience of opportunity costs.

Including only participants who appropriately recalled the opportunity cost (81% for explicit, 70% for implicit, $z = 4.173$, $p < .001$) did not affect the results. Contrast 1 × Proportion Chosen remained (marginally) significant, $b = 11.567$, $SE = 6.142$, $t(739) = 1.883$, $p = .060$. Contrast 2 × Proportion Chosen remained significant, $b = 15.686$, $SE = 6.326$, $t(739) = 2.480$, $p = .013$. Contrast 3 × Proportion Chosen remained nonsignificant, $b = 2.939$, $SE = 6.452$, $t(739) = 0.456$, $p = .649$.

Discussion

In three experiments, we showed that the salience of opportunity costs enhanced the effect of choices on preferences. This was due to consideration at choice rather than at evaluation and did not merely reflect revealed preferences. Previous work showed that the salience of opportunity costs changes the choices that people make; our findings suggest that it also alters people's preferences for those alternatives, primarily by changing evaluations of opportunity costs. Given the potential for greater conflict in which-one decisions, a different design might elicit changes in evaluations of focal options as well.

Implied opportunity costs in one choice may enter subsequent decisions. Our results suggest that choosing to buy a home rather than rent would lead to lower evaluations of renting than would choosing to buy a home rather than not buying. Such lowered evaluations, in turn, would lower one's future willingness to rent. One could imagine analogous decisions regarding where to travel, where to work, or whom to marry.

Factors that affect consideration of opportunity costs should moderate the effect of choices on preferences. Resource constraints and memory cues prompt consideration of opportunity costs (Spiller, 2011). Our findings suggest that they will also cause greater changes in preferences. Given that search involves effort, searching the environment for new options can lead to preferences for discovered options (Ge, Brigden, & Häubl, 2015). If people successfully engage in effortful search of their memory for opportunity costs, similarly enhanced preferences may result.

Although many choices are made in the absence of salient opportunity costs, the effect of such salience on choice-induced preferences has received scant attention in the literature. We show that when opportunity costs are less salient, the effect of choices on preferences is attenuated. These results likely extend to a broad class of choices in which some alternatives are not explicitly represented.

Author Contributions

A. E. Greenberg and S. A. Spiller contributed equally, and their order of authorship was determined alphabetically. Both authors approved the final version of the manuscript for submission.

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Declaration of Conflicting Interests

The authors declared that they had no conflicts of interest with respect to their authorship or the publication of this article.

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Open Practices

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Notes

1. Schrift and Parker (2014) showed that adding a no-choice option to a which-one choice increases persistence. Evaluations of implied opportunity costs were beyond the scope of their research.

2. We used 10 choices to increase statistical power. It is possible that using fewer choices would produce different results.
3. We thank a reviewer for suggesting this experiment.
4. In Experiment 3, a high percentage (53%) of respondents initially evaluated opportunity costs as extremely desirable (100). This percentage was greater than in Experiment 2 (47%), and thus Experiment 3 may have lower power. However, this high percentage of "extremely desirable" ratings does not account for any of the findings.
5. The critical tests of whether our results were driven by choice-induced preferences or preferences revealed through choice are given by the interactions of proportion chosen with each of the three contrasts. If instead we had tested a model with order, explicit opportunity costs, proportion chosen, and all two- and three-way interactions, the three-way interaction would not have been significant.

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