ONLINE APPENDIXES

How Self-Control Shapes the Meaning of Choice

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Online Appendixes A—D contain stimuli, pretests, and ancillary analyses referenced in the article. Online Appendix E contains an additional experiment not included in the final version of the article.

ONLINE APPENDIX A

Manipulations and Ancillary Tests Reported in Study 1

1. CAR OPTIONS

Below are a few car models, all similarly priced.

Please examine them and choose the one you prefer.

				
Toyota Camry	Honda Accord	Nissan Altima	Kia Optima	Hyundai Sonata

Toyota Camry	Honda Accord	Nissan Altima	Kia Optima	Hyundai Sonata
○	○	○	○	○

2. SENTENCE UNSCRAMBLING TASK (Chartrand et al. 2008; Srull and Wyer 1979)

High Self-Control Condition	Low Self-Control Condition
me friends discipline for care my	me friends indulge for care my
very chocolate is regulate this good	very chocolate is impulsive this good
need to behave home go I	need to pleasure home go I
is solution feasible ruthless no there	is solution feasible ruthless no there
opinion not my resolve ignore do	opinion not my hedonistic ignore do
every combination that child knows little	every combination that child knows little
professional willpower doctor was the very	professional selfish doctor was the very
very she grit was really smart	very she spontaneous was really smart
to hold park let's the go	To fulfillment park let's the go
going determination rain to it is	going natural rain to it is
very control the heavy was bag	very unrestricted the heavy was bag
moderation times the rang phone several	free times the rang phone several
you temperance here leave can it	you uncontrolled here leave can it
conceptual calm to I stay tried	conceptual calm to I stay tried
the outside abstinence cute went cat	the outside expression cute went cat
to milk the strict wanted boy drink	to milk the wild wanted boy drink

Note: underlined words varied between conditions. Underlines did not appear in the experiment.

3. PRETESTS

First, a pretest indicated that the self-control manipulation influenced the salience of self-control. Pretest participants (N = 116, recruited from the same pool as participants in Experiment 1) completed the sentence unscrambling manipulation and then made four choices between high and low self-control options (i.e., candy bar vs. apple, partying vs. studying, going out with friends vs. working out, and shopping at a luxury vs. inexpensive store). As expected, ordinal regression analysis indicated that the high self-control condition increased the frequency of choosing options representing high self-control (2.07 vs. 1.60; $\chi^2(1) = 5.74$, $p = .017$).

4. ALTERNATIVE EXPLANATIONS

A separate pretest demonstrates that our self-control salience manipulation did not directly influence preferences for the car models used in the experiment, or shifted participants' preferences in cars more generally. Pretest participants (N = 110, recruited from the same pool as participants in Experiment 1) were randomly assigned to one of the same self-control salience conditions and, after completing the priming task, selected their preferred car among the five sedan options used in the main study. Our manipulation had no effect on participants' car preferences ($\chi^2(4) = 4.10$, $p = .39$).

	Camry	Accord	Altima	Optima	Sonata	Total
Low Self-Control Prime	22 (37.3%)	9 (15.3%)	16 (27.1%)	5 (8.5%)	7 (11.9%)	59 (100%)
High Self-Control Prime	14 (27.5%)	15 (29.4%)	10 (19.6%)	5 (9.8%)	7 (13.7%)	51 (100%)
Total	36 (32.7%)	24 (21.8%)	26 (23.6%)	10 (9.1%)	14 (12.7%)	110 (100%)

Pearson Chi-Square (4) = 4.10, $p = .39$ (no effect of condition on car preferences).

After selecting their preferred option, participants rated the extent to which they thought, while choosing, about other car options other than the ones presented (1 = *not at all*; 7 = *very much*), the extent to which they thought about car attributes or features not present in the cars they had seen (1 = *not at all*; 7 = *very much*), how attractive they found the cars they had seen (1 = *not at all attractive*; 7 = *very attractive*), and how attractive cars in the choice-set seem in comparison to any other type of car they could think of (1 = *not at all attractive*; 7 = *very attractive*).

The results indicate that our effect cannot be explained in terms of participants' preferences or ideal points shifting away from the choice-set. Self-control salience had no effect on participants' tendency to think about other options (M_{low_SC} = 4.03 vs. M_{high_SC} = 3.88; F(1, 108) = .15, p = .70) or attributes not represented in the choice-set (M_{low_SC} = 3.46 vs. M_{high_SC} = 3.75; F(1, 108) = .55, p = .46), and it had no effect on how attractive options in the set seemed in comparison to any alternative participants could think of (M_{low_SC} = 4.17 vs. M_{high_SC} = 4.51; F(1, 108) = 1.29, p = .26). Further, participants rated the options in the experimental choice-set as somewhat *more* attractive overall (M_{low_SC} = 4.75 vs. M_{high_SC} = 5.26; F(1, 108) = 3.44, p = .07). While unexpected, this result is inconsistent with the possibility that self-control salience decreased inferred preference for the chosen option (in the main experiment) by shifting participants' ideal point *away* from the choice-set.

Finally, as an even more direct test of this alternative account, we asked participants to provide a detailed description of their ideal car and its features. Based on participants' responses, we used different attributes to code the overlap between their ideal car and the five white mainstream sedans used in the experiment. These attributes were vehicle category (4-door sedan = 1, else = 0), color (white = 1, else = 0), luxury (no = 1, yes = 0), brand (one of the five brands

included in the choice-set = 1, else = 0), and technology (i.e., electric or hybrid = 0, else = 1). This allowed us to calculate the similarity, in terms of features and characteristics, between each participant's ideal car and the set of five mainstream sedans used in the experiment. If someone's ideal car was a white luxury SUV from a brand not in the set, for example, there is only one overlapping attribute (color) and four non-overlapping attributes, whereas if their ideal car was a 4-door black sedan from a brand in the set, there would be three overlapping and only one non-overlapping attributes. This allows us to test whether the self-control manipulation made participants' ideal car further away from the available choices.

It did not. First, we ran a series of chi-squared tests, with self-control condition as independent variable, on each of the abovementioned attributes separately. Self-control had no effect on the frequency with which participants' ideal point overlapped with the experimental choice-set on any of these attributes (all $\chi^2(1, 110) \leq 1.24$, $p \geq .27$). Self-control participants, for example, were no more or less likely to say that their ideal car was a 4-door sedan (M_{low_SC} = 54.2% vs. M_{high_SC} = 64.7%; $\chi^2(1, 110) = 1.24$, $p = .27$). Second, we also calculated, for each participant, the overall similarity or overlap between their ideal point and the experimental choice-set by summing the five attributes. Self-control had no effect on the total overlap between participants' ideal point and the choice-set ($M_{low\_SC} = 3.32$ vs. $M_{high\_SC} = 3.53$; $F(1, 108) = .59$, $p = .44$).

Taken together, these findings cast doubt on the possibility that our effect was driven by changes in participants' preferences among the car options used in the experiment, or by their ideal points in the car category shifting away from the choice-set.

ONLINE APPENDIX B

Manipulations and Ancillary Tests Reported in Experiment 2

1. MANIPULATIONS

High Self-Control Salience Condition

(Sample: participants viewed these and similar questions in their chosen domain)

Eating Right

Imagine you are choosing an entrée at a restaurant. What would you choose if you were using self-control?

(1) Pasta with rich and delicious Alfredo sauce
(2) Green salad

Shopping and Spending

Imagine you have $100. You can either spend it on something fun (e.g., a pampering spa treatment) or necessities (e.g., groceries, utilities). What would you choose if you were using self-control?

(1) Buy something fun (e.g., a spa treatment)
(2) Buy necessities (e.g., groceries, utilities)

Control 1: Neutral Dilemma Condition

Which of the following food options would you choose?

(1) Pasta
(2) Sushi

Which of the following fruits would you choose?

(1) Apple
(2) Pear

Control 2: No-Dilemma Condition

Participants in this condition simply moved on to the next task.

2. POTENTIAL ALTERNATIVE EXPLANATIONS

The manipulation of self-control salience used in Experiment 2 did not (a) directly influence preferences for the car models described used in the experiment, (b) create cognitive depletion, (c) influence participants' mood, or (d) vary in terms of task effort or difficulty.

Pretest participants (N = 181) were recruited from the same pool as participants in Experiment 2. They were randomly assigned to one of the three self-control salience conditions described in the experiment, and then selected their preferred car among the five sedan options used (see Online Appendix A). Next, participants completed a standard measure of ego depletion and a mood scale. There were no effects on any of these measures:

Car Preference. First, the manipulation did not impact preferences among car options in the choice set ($\chi^2(8) = 3.75$, $p = .88$). This casts doubt on the notion that the effect was driven by the manipulation directly affecting car preferences.

	Camry	Accord	Altima	Optima	Sonata	Total
Self-Control Dilemma	16 (27.12%)	19 (32.20%)	9 (15.25%)	10 (16.95%)	5 (8.48%)	59 (100%)
Neutral Dilemma (Control #1)	16 (26.23%)	19 (31.15%)	15 (24.59%)	7 (11.47%)	4 (6.56%)	61 (100%)
No Dilemma (Control #2)	16 (26.23%)	21 (34.42%)	13 (21.31%)	5 (8.20%)	6 (9.84%)	61 (100%)
Total	48 (26.52%)	59 (32.60%)	37 (20.44%)	22 (12.15%)	15 (8.29%)	181 (100%)

Pearson Chi-Square (8) = 3.75, $p = .88$ (no effect of condition on car preferences).

Depletion. Second, the manipulation did not create ego depletion. Accuracy on a word-color naming Stroop task is often used as a standard measure of depletion (Gailliot et al. 2007; Inzlicht, McKay, and Aronson 2006; Job, Dweck, and Walton 2010; Webb and Sheeran 2003) because on incongruent trials, the meaning of the word interferes with naming the color in which it is written and has to be suppressed for accurate identification of the font color. Participants completed a Stroop task, adapted from prior research (Job et al. 2010), in which color words (i.e., red, green, yellow, and blue) were presented in either congruent or incongruent font color. Words were shown in a sequence, each for one second. After each color word was presented for one

second, participants had to name the color of the font in which the word was written, regardless of the word meaning, by clicking on one of four options listed. Participants had four seconds to enter their response and therefore had to focus and work quickly (all of the participants were able to respond to all of the words). Consistent with prior research, there were 12 color-congruent and 12 color-incongruent words, and the primary outcome was the number of accurate trials.

A (Self-Control Salience: self-control vs. neutral dilemmas vs. no dilemmas) ANOVA indicated that accuracy on the Stroop task was not influenced by the experimental manipulation ($M_{\text{self-control}}$ = 21.15 vs. $M_{\text{neutral\_dilemma}}$ = 20.51 vs. $M_{\text{no\_dilemma}}$ = 21.15; $F(2, 178) = .57$, $p = .57$). Prior research suggests that ego-depletion influences performance on incongruent Stroop trials more than on congruent trials (Inzlicht and Gutsell 2007), so we also conducted a separate analysis for the incongruent trials only. This analysis revealed no effect of condition on accuracy ($M_{\text{self-control}}$ = 10.20 vs. $M_{\text{neutral\_dilemma}}$ = 9.72 vs. $M_{\text{no\_dilemma}}$ = 10.07; $F(2, 178) = 1.05$, $p = .35$).

These findings cast doubt on the possibility that our self-control salience manipulation in Experiment 2 created ego-depletion.

Mood. Third, the manipulation did not impact mood. Participants completed the state version of the Positive and Negative Affectivity Schedule (PANAS; Watson, Clark, and Tellegen 1988; see Schmeichel, Vohs, and Baumeister 2003). Analysis revealed no effects of self-control salience condition on either the positive ($F(2, 178) = 1.61$, $p = .20$) or the negative ($F(2, 178) = 1.14$, $p = .32$) items in the schedule. This casts doubt on the possibility that changes in mood were responsible for our results in Experiment 2.

Difficulty. A separate pretest examined whether the two choice conditions (i.e., self-control choice dilemma vs. neutral choice dilemma) differed in terms of task difficulty. After completing one of the two choice dilemma manipulations, participants (N = 96; recruited from

the same pool as participants in Experiment 2) rated on a 1-7 scale how difficult the choice was and how much effort they put into the choice (r = .51). Condition had no effect on task difficulty, $F(1, 94) = .57, p > .45$).

Taken together, our pretests indicate that our manipulation of self-control salience had no effect on participants' car preferences, ego depletion, positive and negative mood, or task difficulty. Thus, it is unlikely that any of these processes were driving our results.

Ideal point shifting away from the experimental choice-set. A separate pretest, similar to the one reported in Online Appendix A above, demonstrates that our self-control salience manipulation did not shift participants' ideal points in the car category away from the experimental choice-set. Participants (N = 136, recruited from the same pool as participants in Experiment 2) were randomly assigned to either the self-control choice dilemmas or neutral choice dilemmas condition used in Experiment 2. After completing the self-control manipulation, they selected their preferred car among the five sedan options used in the main experiment. Our manipulation again had no effect on car choice ($\chi^2(4) = 3.41, p = .49$).

After selecting their preferred option, participants rated (using the same items reported in Online Appendix A above) the extent to which they thought, while choosing, about other car options other than the ones presented, the extent to which they thought about car attributes or features not present in the cars they had seen, how attractive they found the cars they had seen, and how attractive cars in the choice-set seem in comparison to any other type of car they could think of.

The results indicate that our effect cannot be explained in terms of participants' preferences or ideal points shifting away from the choice-set. Self-control salience, manipulated

through choice, had no effect on participants' tendency to think about other options (M_{low_SC} = 3.68 vs. M_{high_SC} = 4.09; F(1, 134) = 1.57, p = .21) or about attributes not represented in the choice-set (M_{low_SC} = 3.32 vs. M_{high_SC} = 3.69; F(1, 134) = 1.20, p = .28), and it had no effect on the attractiveness of options in the set (M_{low_SC} = 4.87 vs. M_{high_SC} = 4.81; F(1, 134) = .05, p = .82) or on how attractive the options seemed in comparison to any alternative participants could think of (M_{low_SC} = 4.16 vs. M_{high_SC} = 4.56; F(1, 134) = 2.18, p = .14).

Finally, we asked participants to provide a detailed description of their ideal car and its features, and we coded participants' responses based on the same method described in Online Appendix A above. This allowed us to calculate the extent of overlap or similarity between each participant's ideal car and the cars in the experimental choice-set. Self-control had no effect on the frequency with which participants' ideal point overlapped with the experimental set on any of these attributes (all $\chi^2(1, 136) \leq .735$, $p \geq .39$). Self-control had no effect on the total overlap between participants' ideal point and the choice-set (M_{low_SC} = 3.34 vs. M_{high_SC} = 3.46; F(1, 134) = .27, p = .60).

Taken together, these findings cast doubt on the possibility that our effect was driven by changes in participants' preferences among the car options used in the experiment, or by their ideal points in the car category shifting away from the choice-set.

ONLINE APPENDIX C

Materials and Tests Reported in Experiments 3 and 4

1. PAINTING OPTIONS

Below are a few paintings by various artists.
Please examine them and then choose one.


Picasso


Matisse


Modigliani


Monet


Cézanne

2. SELF-CONTROL SALIENCE MANIPULATION PRETESTS

We pretested the effectiveness of our "life experiences" priming manipulation by asking participants to complete the manipulation and then respond to the Tangney et al. (2004) self-control scale. As expected, the high self-control condition increased ratings on the scale (3.39 vs. 2.93; $F(1, 56) = 4.62$, $p = .036$). Note that this is a particularly strong test of our priming manipulation as this scale is thought to tap a chronic self-view. The pretest result suggests that our manipulation successfully increased the salience of self-control.

3. ALTERNATIVE EXPLANATIONS

A separate pretest tested whether our self-control priming manipulation had any direct effect on preferences for the artwork. Pretest participants (N = 241) were recruited from the same pool as participants in Experiment 3. They were randomly assigned to one of the two self-control accessibility conditions described in the experiment, and then selected their preferred art among the five options used. The results, described below, suggest that our self-control salience

manipulation in Experiment 3 has no direct effect on preferences among the art options used in the experiment ($\chi^2(4) = 3.98$, $p = .41$).

	Picasso	Matisse	Modigliani	Monet	Cezanne	Total
Self-Control Experience	22 (18.2%)	10 (8.3%)	13 (10.7%)	65 (53.7%)	11 (9.1%)	121 (100%)
Impulsive Experience	24 (20.0%)	4 (3.3%)	10 (8.3%)	66 (55.0%)	16 (13.3%)	120 (100%)
Total	46 (19.1%)	14 (5.8%)	23 (9.5%)	131 (54.4%)	27 (11.2%)	241 (100%)

Pearson Chi-Square (4) = 3.98, $p = .41$ (no effect of condition on art preference).

ONLINE APPENDIX D

"Life Experience" Manipulation Reported in Experiment 5

1. LIFE EXPERIENCE PRIMING MANIPULATION

To activate the notion of self-control, we used a slightly modified version of the "life experiences" task used in Experiments 3—4 (in addition to also using the sentence unscrambling prime from Experiment 1). Participants in the high self-control condition were asked to "think about a decision you made, in any area of life, in which it was very important for you to show strong self-control or discipline rather than follow your inner desires (for example, buying an item because you were expected to do so)." In the low self-control condition, participants were asked to "think about a decision you made, in any area of life, in which it was very important for you to follow your inner desires - your individual preferences, beliefs, emotions, or impulses (for example, buying an item simply because you really wanted it even though it may not have been "the right thing" to choose)." Considering the wording differences between this version and the one used in Experiments 3—4, one may wonder whether, rather than activating self-control in general, the specific wording used in Experiment 5 somehow drew attention to the idea that self-control conflicts with preferences. We conducted pretests to validate the effect of the manipulation on self-control activation and to test the abovementioned alternative account.

2. PRETESTS

We conducted two pretests to examine (1) whether our manipulation made the notion of self-control accessible as intended, and (2) whether it did so without altering people's lay-

theories regarding self-control or the perceived relationship between self-control and choice-preference correspondence.

Manipulation effectiveness. Pretest participants (N = 62) completed the "life experiences" manipulation and then completed the Tangney et al. (2004) self-control scale. As expected, the high self-control condition increased ratings on the scale (3.35 vs. 2.91; $F(1, 60) = 4.21$, $p < .05$). Note that this is a particularly strong test of our priming manipulation as this scale is thought to tap a chronic self-view.

Alternative account. Participants (N = 85) completed the "life experiences" manipulation from Experiment 5 and then rated their agreement, on a seven-point scale (1 = *strongly disagree*; 4 = *neither agree nor disagree*; 7 = *strongly agree*), with the statement "The choices I make when using self-control may not reflect my true inner preferences to the same extent as the choices that I make when not using self-control." There was no difference between conditions ($M_{\text{high self-control}} = 5.02$ vs. $M_{\text{low self-control}} = 4.89$; $t(83) = .61$, $p = .54$). Anecdotally, agreement in both conditions was significantly higher than the neutral midpoint ($t(43) = 4.19$, $p < .0001$), and $t(40) = 4.27$, $p < .0001$, respectively), replicating our finding that, on average, people associate choices made under self-control with the suppression of their preferences (see also our pilot study and Experiments 3—4).

Taken together, results of our pretest, as well as the fact that the same result was obtained with a very different self-control prime (i.e., the sentence unscrambling task), cast doubt on the possibility that the specific wording used in the "life experiences" manipulation in Experiment 5 influenced lay-theories associated with self-control, other than simply bringing the general notion of self-control to mind.

ONLINE APPENDIX E

Additional Experiment Not Included in the Final Version of the Article

THE MODERATING ROLE OF SOCIAL-CLASS BORNE LAY-THEORIES

This experiment has three main goals. First, we examine whether these effects extend to brand loyalty. If self-control salience attenuates the tendency to infer preferences from choice, as we suggest, than it should increase brand switching.

Second, we use a decision with real consequences. Participants chose artwork by various artists, and we later offered them the option to receive an art poster by the same artist whose work they had chosen, or to switch and receive a poster by a different artist. If choice is seen as indicative of individual preferences, then post-choice preference should correspond to the option chosen before. We predicted, however, that high self-control salience would decrease the tendency to stick to prior choices and increase switching behavior.

Third, the experiment tests our theory by examining whether the effect of self-control salience is moderated by differences in the lay-theory that choice reflects individual preferences. Prior work demonstrates that in contemporary American society, people with higher socioeconomic status (SES) see choice more as reflecting individual preferences whereas people with lower SES see choice less as an expression of one's individual preferences and more as reflecting societal standards, roles, and expectations (Snibbe and Markus 2005; Na and Kitayama 2012; Na et al. 2016; Stephens et al. 2011; Stephens et al. 2007). If, as we argue, self-control salience undermines the lay-theory that choice reflects one's individual preferences, then SES should moderate self-control's effects. Among people with high SES, who tend to see choice as indicative of preference at baseline, self-control salience should weaken the tendency to infer

preference from choice. Self-control's effects should be attenuated among people with low SES, however, because they already tend to see choice as less indicative of preferences.

Method

Participants (N = 201; mean age = 37; 52% women) completed this study on Mturk as part of a session including several unrelated studies. They were randomly assigned to one of two self-control conditions (high vs. low). The second independent variable, SES, was measured (see below).

Participants first completed a task described as a survey about art preferences. They saw several pictures of paintings by renowned artists and were asked to choose one.

Then, in a purportedly unrelated survey about life experience, we primed high or low self-control using the same "life experiences survey" task described in Experiment 5 (i.e., thinking about a decision that involved high or low self-control). We excluded participants who entered bogus responses (e.g., "wer," "nice," "2020"), leaving a valid sample of 180.

After completing the life experiences survey, we told participants that, as an additional token of appreciation, their name would be entered into a lottery to win a poster of a painting by one of the artists featured in the art survey. We asked them to indicate what they preferred: a poster by the same artist they chose earlier or a poster by a different artist. This binary behavioral measure served as our focal dependent measure. If choice is seen as indicative of inner preferences, then post-choice preference should correspond to the chosen option, more than if choice is not seen as indicative of preference.

Finally, participants responded to several demographic measures, including their level of education. Prior research on social class and the meaning of choice (Snibbe and Markus 2005;

Stephens et al. 2011; Stephens et al. 2007; Varnum et al. 2012) often uses college degree attainment as an indicator of SES (i.e., working class vs. middle class), so we do the same here. We coded participants based on whether they had a college degree or not. We expected self-control salience to decrease the association between prior choices and future preferences among participants with a college degree, but this effect should be attenuated among participants without a college degree.

Results

A 2 (self-control: high vs. low) X 2 (SES: high vs. low) binary logistic regression analysis on choice-preference consistency revealed a main effect of self-control condition: as in our prior experiments, when high self-control was salient, participants' preferences were less consistent with their prior choices (80.2%) than when low self-control was salient (90.4%; $\chi^2(1) = 6.64$, $p = .01$).

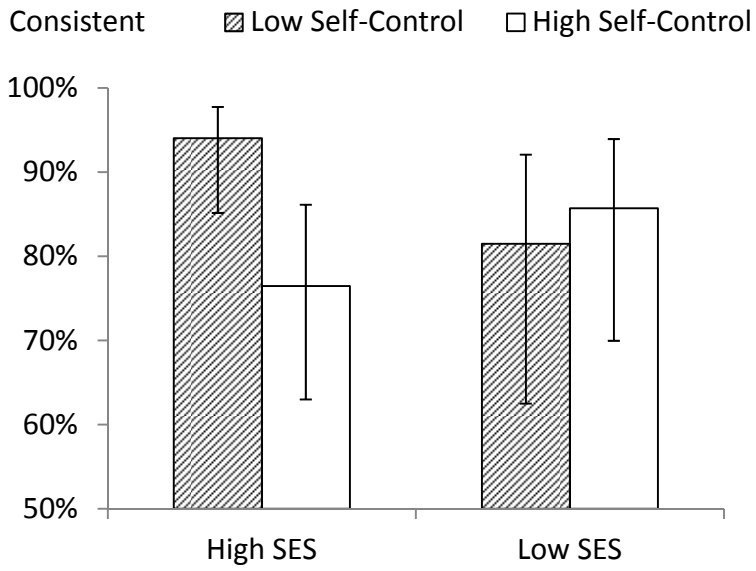
More importantly, as predicted, this main effect was qualified by a self-control X SES interaction ($\chi^2(1) = 4.18$, $p = .04$): whereas making high self-control accessible decreased choice-preference consistency among high SES participants (76.5% vs. 94.0%; $\chi^2(1) = 7.62$, $p = .006$), it had no effect among low SES participants (85.7% vs. 81.5%; $\chi^2(1) = .020$, $p = .65$). See figure 4.

Discussion

This experiment supports our proposition using a choice with real consequences. Making high self-control salient attenuated the correspondence between post-choice preferences and previously chosen options.

Further, moderation evidence underscores the process behind these effects. Consistent with our suggestion that the effect of self-control is driven by the tendency to see choice as indicative of inner preferences, it was moderated by SES. Among people who tend to see their choice as indicative of inner preferences at baseline (i.e., those high in SES), self-control salience undermined choice-preference consistency. Among people who tend to see choice less as an expression of individual preferences to begin with (i.e., those lower in SES), however, the effect disappeared.

Figure 4:
Effect of Self-Control and SES on Choice-Preference Consistency (i.e., Preference for the Previously Chosen Option)



Note: error bars represent 95% confidence intervals