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Dazed and confused by choice: How the temporal costs of choice freedom lead to undesirable outcomes

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ABSTRACT

We propose that individuals underestimate the costs of making choices relative to the benefits of finding the best option. Specifically, we demonstrate that research participants make systematic mistakes in predicting the effect of having more, vs. less, choice freedom on task performance and task-induced affect. Even when participants have the information to understand that the costs of choice freedom outweigh its benefits, they still predict that choice freedom will lead to better performance and more positive affect. As a result, those who have the option to choose exercise it, yet end up performing worse and feeling worse than those who do not have that option.

Introduction

People are often willing to undergo extensive searches in order to find the "best" option. For example, travelers shop around to find the most satisfactory tickets, investors wait for the most promising market conditions before picking stocks, and singles engage in intensive dating when looking for the perfect spouse. Research has, however, demonstrated that search processes among choice-set options often involve costs (Bettman, Luce, & Payne, 1998; Payne, Bettman, & Johnson, 1993). In certain circumstances, the costs associated with the time spent searching for the best option may even be greater than the benefits that option provides, resulting in faulty decisions and undesirable outcomes: travelers may end up paying a higher price for the same ticket, investors may forgo significant gains, and singles may become too old to marry. In this paper we focus on the temporal costs of choosing and investigate whether individuals are able to discern situations in which freedom of choice should be relinquished because its costs are greater than its benefits. We conclude that people tend to underestimate the temporal costs of choosing relative to the benefits of finding the best option. Consequently, decision makers insist on exercising their choice opportunities even when these opportunities lead to poor outcomes.

Benefits and costs of choosing

Suppose that a person wants to invest $10,000 cash in a 1-year certificate of deposit (CD) at a particular bank and that the rate at which this bank offers its CDs changes every week. Now consider two alternative scenarios. In the first (let us refer to it as the "less-freedom" condition), the investor must make a decision in the next 4 weeks. In the second (the "more-freedom" condition), the investor can wait as long as she likes in order to pick the rate she considers to be the most favorable.

From the perspective of rational choice theory, more-freedom is always better than less-freedom because it allows decision makers to maximize utility by finding the best match between well-defined individual preferences and available alternatives (Hotelling, 1929). From a psychological perspective, more-freedom is better than less-freedom even when individual preferences are not firmly established, because it motivates decision makers to subjectively bolster their satisfaction with the choice outcomes (deCharms, 1968; Festinger, 1957; Langer, 1975; Shafir, Simonson, & Tversky, 1993).

Despite these benefits, more choice freedom involves greater cognitive and emotional costs (Bettman et al., 1998; Payne et al., 1993). The cognitive costs relate to the mental energy spent in selecting the choice-set options and in searching for the best option within a given set (Shugan, 1980). For example, our investor would need to exert greater cognitive effort in order to analyze and compare the relative attractiveness of an indefinite set of rates

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than of a more defined set. This greater cognitive effort may result in lower-quality outcomes if she becomes overwhelmed by the amount of information provided (Malhotra, 1982) and resorts to choice heuristics that compromise decision accuracy to conserve mental energy (Payne et al., 1993).

The emotional costs of more choice freedom concern the greater psychological distress of forgoing a larger number of options such as, in the case of our investor, the interest rates offered during an indefinite number of weeks vs. the interest rates offered during a limited number of weeks. Whenever a dominating alternative is not available, the act of choosing one option and contemporarily giving up others causes decision makers to experience loss aversion and emotionally difficult trade-offs, which reduce the attractiveness of each option (Brenner, Rottenstreich, & Sood, 1999; Hsee & Leclerc, 1998; Luce, 1998), as well as a sense of postchoice discomfort, self-blame, and regret (Carmon, Wertenbroch, & Zeelenberg, 2003; Ritov & Baron, 1995). As with the cognitive costs, these emotional costs have been shown to decrease decision quality, leading to choice avoidance and lower outcome satisfaction (Dhar, 1997; Iyengar & Lepper, 2000; Luce, 1998).

In addition to investigating cognitive and emotional costs, researchers have also examined costs that are associated with the time required for the decision-making task, or the monetary costs of searching for information and forgoing alternative opportunities (Stigler, 1961; Weitzman, 1979). Although optimal search models in economics assume that individuals would stop searching for the best option if the costs of finding this option outweighed its expected benefits, research in psychology has shown that decision makers often make faulty decisions because they fail to understand temporal costs. For instance, people delay decision-making in order to collect information that is unlikely to affect the decision itself (Bastardi & Shafir, 1998; Tversky & Shafir, 1992) and, when confronted by difficult choices, they prolong the search process to the extent that they will obtain suboptimal outcomes (Huberman, Iyengar, & Jiang, 2007). Our investor's search for the best investment opportunity may, therefore, result in unnecessary losses due to information-gathering costs and forgone interests.

Besides these direct search and opportunity costs, time influences the quality of decisions through its indirect effect on emotional and cognitive responses (Wright & Weitz, 1977). Decision makers who are under time pressure to find the best option are likely to experience negative emotions such as distress and anxiety (Janis & Mann, 1977). Stress, in turn, has been found to reduce available mental resources, generate distracting thoughts, and result in poor decision-making (Hutchinson & Alba, 1991; Keinan, 1987; Sarason, 1984). If our investor peruses her investment opportunities for too long, she may end up choosing a suboptimal investment rate because of the psychological pressure to reach a decision and the consequent distracting anxiety.

Cost-benefit estimation and preference for choice

The empirical evidence reviewed above shows that different costs related to choice freedom—cognitive, emotional, and temporal—may be a direct or indirect cause of faulty decisions. Based on this evidence it seems plausible to predict that individuals will sometimes accept restrictions to their choice freedom. On the contrary, however, recent findings suggest that people are reluctant to limit their choice freedom even when confronted by the detriments of choice. For example, a series of studies conducted by Chernev (2006) revealed that respondents preferred choosing from a larger rather than a smaller assortment despite realizing that the greater choice freedom offered by the larger set came at the cost of a more difficult selection process. Research has also found that individuals prefer making their own choices to having the same choices made by others even though in some circumstances self-made choices generate lower satisfaction than other-made choices (Botti & McGill, 2006). Similarly, Griffin and Broniarczyk (2010) showed that the quest for the best choice-set option can lead decision makers to continue searching even when this search yields diminishing returns to satisfaction.

How can we explain peoples' insistence on exercising choice freedom in the face of its negative consequences? The findings of a study conducted by Botti and Iyengar (2004) may provide an initial insight into this paradox. Participants presented with a choice-set including four pasta dishes that were either all liked or all disliked predicted that they would be more satisfied with a self-chosen pasta than with a pasta chosen by a friend. This prediction proved, however, to be erroneous. Whereas participants confronted by all appetizing pastas reported to be more satisfied with the self-chosen than with the friend-chosen pasta, those confronted by unappetizing pastas reported to be less satisfied as a result of their own, as compared to their friend's, choice. We believe that this incongruence between predictions and assessments for participants choosing from among undesirable options, relative to those choosing from among desirable options, can be explained by the fact that they experienced greater cognitive and emotional costs (Miller, 1944) but were unable to correctly weigh the negative impact of these costs relative to the benefits of choosing the best (or least worse) pasta.

Research on power provides theoretical support to this explanation. The exercise of power, which involves the control of one's own and others' valuable resources, has been found to increase attention to rewarding information (Anderson & Berdahl, 2002). High-power individuals, therefore, focus on the potential positive, rather than negative, payoffs of a risky decision (Anderson & Galinsky, 2006) and minimize the predicted negative experience of losses but not the predicted positive experience of gains (Inesi, 2010). Power and choice are theoretically related because they are both associated with the construct of control (deCharms, 1968; Fast, Gruenfeld, Sivanathan, & Galinsky, 2009). Hence, these results substantiate our proposition that people may incorrectly weigh the relative benefits and costs of choosing.

We therefore theoretically contribute to prior research on judgment and decision-making by proposing a novel explanation for people's preference for choice freedom in spite of its detriments. We argue that people systematically underestimate the costs of choice compared with its benefits, resulting in the belief that more choice freedom leads to better outcomes than less choice freedom. This belief is true in many cases, either because choosers are indeed able to identify the best match between their preferences and the available alternatives (Hotelling, 1929) or because they subjectively increase the value of their decision outcomes (deCharms, 1968; Festinger, 1957; Langer, 1975; Shafir et al., 1993). Yet, in some circumstances the costs of choice freedom may exceed the benefits of selecting the most satisfying option.

Like many other biases, our proposed cost-benefit misestimation is a result of overgeneralization. For example, people automatically associate high input quantities with high outcome quality, even though these two factors are often negatively related (Chinander & Schweitzer, 2003). Similarly, they may automatically associate freedom of choice with best decision outcomes even when the costs of choice are in fact greater than its benefits.

The effects of misestimating the temporal costs of choice freedom

In this paper we specifically examine the direct and indirect effects of the temporal costs of choice freedom. In terms of our initial example, the direct temporal costs are the monetary losses in-

curred by the investor in her search for the perfect investment opportunity, such as the price one has to pay to see more options or the opportunity cost one incurs by viewing more options. The indirect temporal costs refer to the emotional distress generated by missing gains and the impairment of the cognitive function caused by this distress. Although the investor ought to be aware of these costs, we predict that she will consider them to be less important than the benefits of finding the most satisfactory investment opportunity. As a result, she will prefer more choice freedom to less choice freedom but she will oversearch, thereby obtaining a suboptimal return.

More generally, we hypothesize that despite having all the information about the temporal costs and the benefits of choice freedom, decision makers systematically underestimate the temporal costs relative to the benefits of selecting the best option, and as a result expect more positive outcomes in conditions of more choice freedom than in conditions of less choice freedom. Those who have the option to operate in conditions of more choice freedom will exercise this option, extend their search for too long, and achieve worse outcomes than those who do not have this option. Hence, we expect decision makers to resent having less choice freedom and to seek more choice freedom even in those circumstances in which they would in fact profit from choice restriction.

To test this hypothesis we conducted four laboratory studies in which participants were provided with a quantification of both the benefits and the temporal costs of choosing and were asked to perform tasks involving more or less choice freedom after obtaining incentives for being accurate. In the first three studies, participants' forecasts about task performances and affective responses were then compared with actual results. This study procedure offers a methodological contribution to prior research, in which decision quality was assessed either indirectly, by showing that people are more likely to procrastinate or to choose inconsistently (Dhar, 1997; Huberman et al., 2007; Tversky & Shafir, 1992), or subjectively, by measuring individuals' self-reported outcome satisfaction (Botti & Iyengar, 2004; Botti & McGill, 2006). In contrast, in our studies the quality of the participants' decisions was determined directly by an objective standard: the measure of their task performance.

Study 1

Method

Study 1 tested our hypothesis by quantifying the direct temporal costs of choice freedom in a context similar to that of our initial example. In this study, instead of choosing a CD rate over different weeks at the same bank, participants chose a CD rate across different banks during the same period. Despite the surface difference between the two, their logic is the same.

One hundred thirty-six students at a large private university in the United States participated in this computer-based study in exchange for extra class credit and the possibility of winning one of five $10 cash prizes raffled off among the best performers. These cash prizes were offered as an incentive for participants to make correct decisions resulting in higher performances.

Participants sat in front of computers and read the experiment instructions, which asked them to imagine having $10,000 in cash to invest in a 1-year certificate of deposit (CD). Participants were informed that a virtually unlimited number of banks provided CDs but that each bank offered different interest rates ranging from 3.01% to 4.00%, and that all rates within this range were equally likely. They were also told that the selection of the bank from which to buy the CD could have been made by using either one of two online services. One service (multiple-set) would initially charge $7 to show three randomly selected banks with their corresponding interest rates and allowed customers to decide whether to select one bank from this initial set or to spend an additional $7 to view another set of three randomly selected banks for as many times as they wished. The other service (one-set) would instead charge a $7 fee to present customers with only one set of three randomly selected banks from which one bank had to be selected (see "Appendix A").

Participants were randomly assigned to one of three conditions: prediction ($n = 61$), more-freedom ($n = 38$), and less-freedom ($n = 37$). Predictors initially read one of the two service descriptions and were shown an example of the service procedure, but they were not asked to actually use the service; next, they read the description of the other service. These descriptions provided predictors with a clear quantification of the costs and benefits associated with having more choice freedom: unlike less-freedom participants, more-freedom participants could pay $7 for the chance of finding a higher interest rate in the next set of banks compared with the previous set. After reading the two descriptions, predictors answered a short questionnaire. The first question asked about their service preferences ("Which of these two services would you prefer?"), whereas the second question asked them to predict which service would be more likely to generate a higher return on the investment, calculated as the chosen interest rate minus the total incurred search fee ("Which of these two services do you think will ensure a higher return?"). A final, open-ended question asked predictors to "briefly describe the reasons" for their liking or dislike of the two services.

Participants in the prediction condition were acquainted with both services and forecasted the corresponding return on investment, but did not perform the decision-making task. In contrast, participants in the more- and less-freedom conditions read only the description of, respectively, the multiple-set service or the one-set service before performing the corresponding choice task. Each participant's total return on investment was calculated automatically by the computer. Participants were also asked to briefly describe in an open-ended format the reasons for their liking or dislike of the choice process they had experienced.

Note that from an economic perspective, this study is part of the class of optimal stopping decision problems in which individuals wish to maximize the probability of selecting the best alternative from a set of alternatives that are inspected sequentially in a random order and that cannot be recalled (the so-called "secretary problem"—Ferguson, 1989; Weitzman, 1979). According to these normative models, the more-freedom condition ensures greater returns than the less-freedom condition, because in the former participants can use an optimal stopping rule, which in our case is: continue the search if the highest rate in the current set is below 3.77%, and stop the search otherwise (see "Appendix B" for details about the calculation of this stopping rule). Whereas the economic literature examined optimal search rules, the behavioral literature has focused on more descriptive aspects of search under the assumption of risk neutrality and has shown that decision makers generally behave suboptimally by stopping the search earlier than predicted by the stopping rule (Seale & Rapoport, 1997; Zwick, Rapoport, Lo, & Muthukrishnan, 2003). In the present paper, however, we predict the opposite effect: that the relative underestimation of the direct temporal costs of choosing—which were quantified in the $7 search fee—will cause participants in the more-freedom condition to oversearch, therefore achieving a lower overall financial return than participants in the less-freedom condition.

Results

We first examine the predictors' forecasts and then compare the results of participants in the more-freedom condition (those who

had the opportunity to choose from multiple sets) with the results of those in the less-freedom condition (those who could choose from one set only).

Predicted performance

Predictors forecasted that more-freedom participants would obtain a higher return than less-freedom participants (73.77%; χ^2 (1) = 13.79, $p < .0005$). They also preferred the more-freedom to the less-freedom condition (63.93%; χ^2 (1) = 4.74, $p < .05$).

Actual performance

Normatively, more-freedom participants had an advantage over less-freedom participants because they could decide at each trial whether to peruse additional options or to stop the search for a higher rate. However, our research question has to do with people's actual behavior, and specifically whether more-freedom participants would underestimate the temporal costs of choice and would oversearch. Results show that they did oversearch.

Participants' total investment return ranged between $281 and $393. A one-way ANOVA with freedom (more-freedom vs. less-freedom) as independent variable and interest rate as dependent variable revealed that the interest rate obtained by participants who chose from multiple sets ($M = 3.80$, $SD = 0.18$) was on average not significantly different from that obtained by participants who chose from one set ($M = 3.77$, $SD = 0.18$; $F(1, 73) < 1$, *ns*). The same one-way ANOVA on overall investment return yielded a main effect ($F(1, 73) = 5.22$, $p < .05$): contrary to the predictors' forecasts, the average investment return in the more-freedom condition ($M = 359.16$, $SD = 24.03$) was lower than that in the less-freedom condition ($M = 370.30$, $SD = 17.62$).

Taken together, these results suggest that participants in the more-freedom condition oversearched, stopping their search for the best interest rate too late. Indeed, the average number of rounds (including the success round) needed to obtain a rate of 3.77% or higher is only 1.84 (see "Appendix B" for calculation details), whereas our results show that more-freedom participants viewed on average 2.71 lists of banks. Thus, as hypothesized, the lower performance in the more-freedom condition could be attributed to participants' underestimation of the costs of having access to an additional set of banks relative to the benefits of potentially finding a higher interest rate in this additional set.

Qualitative evaluations

The answers to the open-ended questions about participants' reasons for liking or disliking the two services were examined by two judges who were unaware of the research hypotheses. In order to ensure a higher degree of reliability, we sought to organize participants' responses according to six categories. Responses were coded as "best option" if participants expressed the belief that the service would allow them to obtain a higher interest rate or overall investment return ("I feel that you have a better chance of selecting the right one"). Responses were coded as "affective benefits and costs" if participants referred to emotional states that were either positive, including the pleasurable feeling of being in control ("this service makes me feel happier with the process," "you aren't left wondering 'if I had spent more money, would I have obtained a better rate?"), or negative, including regret ("too many options are stressful"). A "cognitive costs" coding referred to answers that indicated the extent of mental effort involved in the choice task ("the service seems a bit more confusing"). The coding of the responses as "mere preference for choice" was used to indicate answers related to the desire of having options for the sake of it ("I would prefer using the additional sets because it allows me more options"). Finally, answers that alluded to the trade-offs that participants had to make when deciding to pay the fee to see another set of options were coded as "temporal costs" ("because the three banks are selected at random, viewing more sets does not guarantee a bank with a better rate"). The intercoder agreement was 90%, and any disagreement was resolved through discussion.

Results showed that 27% of the thoughts expressed by participants referred to their belief that by choosing they could achieve the best result, 15% were related to the recognition of temporal costs, 14% spoke of a mere preference for having options, 12% were about the negative affect generated by having to choose and the relief of not having to choose, 8% were about the positive affect associated with choice and control, and, finally, 6% were about the cognitive effort involved in the search task. A more in-depth analysis of the main thought categories revealed that, whereas thoughts about best result and mere choice preference did not vary across freedom conditions (*F*s (2, 106) < 1, *ns*), thoughts about temporal costs did vary ($F(2, 106) = 4.57$, $p < .05$) and were more likely among less-freedom participants ($M = 0.39$, $SD = 0.68$; $F(2, 106) = 5.33$, $p < .05$) and predictors ($M = 0.48$, $SD = 0.81$; $F(2, 106) = 7.82$, $p < .01$) than among more-freedom participants ($M = 0.07$, $SD = 0.27$).

Discussion

In this first experiment, predictors understood that more choice freedom (choosing from multiple sets) was normatively superior to less choice freedom (choosing from only one set) and preferred the option of exercising choice to that of relinquishing choice based on the forecast that greater choice freedom would lead to greater returns on investment. In reality, consistent with prior results in behavioral economic research (Seale & Rapoport, 1997; Zwick et al., 2003), participants in the more-freedom condition underperformed and their overall investment return was lower than that of participants in the less-freedom condition. Whereas experimental research on sequential search has attributed individuals' suboptimal behavior to a tendency to stop the search too soon, in this paper we contend that more-freedom participants oversearched because they focused on the benefits of choosing (the possibility of achieving a higher rate) and failed to correctly weigh its temporal costs (the costs of an additional search). The qualitative analysis of the thought-protocols is consistent with this interpretation in that it suggests that participants thought about different costs and benefits of choice, yet the costs of searching were less salient than its benefits, especially among participants in the more-freedom condition.

A similar result was found by Shu (2008), who observed that consumers deciding when to use a free ticket provided by an airline searched too long to find the "best match." The task investigated by Shu is similar to the one presented in study 1 in that an option could be selected only at the time it appeared, opportunities could not be recalled if rejected, and full knowledge of the distribution of outcomes was available. Unlike in study 1, however, this task allowed participants to observe other possible alternatives after the choice was made, the payoff was directly related to both the value of the option chosen and the cost of the options not pursued, and the best match had a relatively low probability compared with other acceptable outcomes. Shu attributed the suboptimal behavior to searchers' overestimation of the probability of obtaining a desired outcome, as well as to their underestimation of the value of second-best alternatives. In contrast, we explained participants' tendency to oversearch as an underestimation of the costs of choice freedom relative to its benefits, and we tested this explanation by comparing participants who had greater freedom, those who could select additional choice-sets until they found a best match, with participants who had less freedom, those who could select the best match from among a predefined set.

Nevertheless, the reader may argue that the oversearch was not a systematic bias, because more-freedom participants did not know what kinds of interest rates they would encounter if they continued the search and most of them would not have the mathematical sophistication to know when to stop. However, we still consider their oversearch to express a systematic bias toward underestimating the temporal costs of choice. First, we told participants that the banks' rates ranged from 3.01% to 4.00% and that all numbers within this range were equally likely; thus they should have known that on average the next set of banks would not be better than the current set of banks. Second, we told them that this uncertain search for a higher rate had a certain cost. Although there was no reason to expect naïve respondents to correctly calculate that number, if they had been making only random errors, then more-freedom participants should have undersearched or oversearched in equal numbers. However, most of these participants oversearched rather than undersearched, so we consider the oversearch to be a systematic bias.

The next two studies used a different context (a cognitive task) to provide additional empirical support to our hypothesis that the systematic underestimation of the temporal costs of choosing the best option, relative to the benefits that this best option provides, causes decision makers to be drawn to choice even when it leads to unpredicted worse outcomes. Whereas in study 1 the more-freedom condition included a potentially unlimited number of options and the less-freedom condition included a limited number of options, in studies 2 and 3 we used a more extreme manipulation of choice freedom in that the more-freedom condition entailed a limited number of options and the less-freedom condition entailed no-choice options—hence we labeled these conditions, respectively, "freedom" and "no-freedom." In terms of the investment decision exemplified initially, the situation investigated in studies 2 and 3 is akin to one in which the interest rate of an investment is either chosen by an investor or predefined by the bank.

In studies 2 and 3 we also examined whether the experience of choice freedom helps individuals realize the possibility of its negative effects. To do so, we asked participants in the freedom and no-freedom conditions to make the same forecasts as predictors. As in study 1, the choice task employed in these two experiments theoretically guarantees freedom participants an advantage over no-freedom participants; yet, we believe that relative cost underestimation will cause all participants to erroneously forecast superior outcomes and to prefer a self-made choice to a predefined choice. Predictors' forecasts were examined in joint evaluation mode in study 2 and in separate evaluation mode in study 3 (Hsee, 1996).

Finally, the cost-benefit structure of the task employed in studies 2 and 3 allows for a more detailed examination of both the direct and the indirect effects of the temporal costs of choice. Relative to study 2, the cost-benefit structure of the task used in study 3 made the temporal costs of choosing even more salient in order to examine whether greater transparency would improve participants' ability to factor in these costs when judging the desirability of choice freedom.

Study 2

Method

One hundred eight students at a large private university in the United States took part in this study in exchange for extra class credit and the possibility of receiving one of ten $10 cash prizes offered to the best performers as an incentive to be accurate. As in study 1, participants were randomly assigned to three conditions: prediction ($n = 58$), freedom ($n = 28$), and no-freedom ($n = 22$). All participants read the experiment instructions on a computer screen and learned that a memory task required them to memorize as many randomly generated 7-digit phone numbers as possible within 5 min. They were also told that they would gain .9-points for each correctly memorized phone number and lose .1 point for each incorrectly memorized phone number.

Predictors read that there were two different task procedures. One procedure (freedom condition) consisted of giving participants a set of 10 different randomly generated numbers from which to select a single number to memorize. After making their choice, participants would click on that number and enter it into a field provided on the following screen before moving onto the next set of 10 numbers. However, if participants changed their mind after selecting the number to memorize, they would be able to return to the same list and pick another one without incurring any penalty. The other procedure (no-freedom condition) involved participants being presented with one number at a time; after memorizing it, they would click on the number and enter its digits into the field on the following screen before continuing to the next number.

Predictors read both descriptions and saw an example of the two different versions of the memory task, but did not perform the task. Next, they answered a short questionnaire similar to that employed in study 1. First, they were asked about their preferences ("If you were to actually take this test, which test would you prefer taking?"), then they were asked to predict which test procedure would be more likely to generate a higher test score ("In which of these two tests do you think participants would receive a higher score?") and a more positive task-induced affect ("Which of these two tests do you think participants would like taking more?" "In which of these two tests do you think participants would have better feelings while taking the test?").

Participants in the freedom and no-freedom conditions read only the instructions related to their condition and performed either the memory task that allowed choice or the memory task that did not allow choice. Thus, those in the freedom condition saw a set of numbers from which they could select a number to memorize, whereas those in the no-freedom condition saw only one number to memorize. Both sets of participants entered the memorized number into a field on the next screen and then moved on to see, respectively, a new set of numbers or a new single number. A timer on the upper right corner of the screen helped all participants keep track of the time, as the study automatically ended after 5 min, timed from the beginning of the memory task. Participants filled out a questionnaire after completing the memory task and before knowing their final score. First, they were asked to indicate on a 9-point scale (1 = *very bad*/*not at all*; 9 = *very good*/*very much*) their affective responses to the task ("How did you feel while taking this test?" and "How much did you like taking this test?"). Next, they were informed of the other experimental condition by reading the instructions reported below:

> In this study you could have been in one of two conditions: (1) condition A: You choose each phone number to memorize from a list of 10 numbers randomly generated by the computer; (2) condition B: You do not choose the phone numbers to memorize. They are randomly generated and assigned to you by the computer.

After being reminded of the condition to which they had been assigned, participants indicated their preferred choice condition ("If you were to do this study again, in which of these two conditions would you prefer to be?") and their predictions about test performance and task-related affect in the two conditions ("In which of these two conditions do you think people will receive a higher score on the test?" "In which of these two conditions do

you think people would like taking this test better?" "In which of these two conditions do you think people would have better feelings while taking this test?"). Finally, participants were asked to assess the difficulty of the task on a 9-point scale (1 = *not at all*; 9 = *very much*) and to describe in response to an open-ended question the perceived benefits of being in the condition that they preferred.

Thus, in this study, the advantage of having choice freedom consisted of the possibility of selecting the best (easiest) number to memorize in each trial in order to maximize the number of points earned. On the other hand, freedom participants were at a disadvantage because the process of selecting the numbers to memorize used up time. A reduction in the amount of time available could negatively affect their cognitive performance both directly (fewer trials available to accumulate points) and indirectly (more mistakes due to distraction and negative affect).

From a normative perspective, study 2 is similar to study 1 in that it ensures that having choice freedom is at least weakly better than not having choice freedom. Those in the freedom condition can always decide whether the cost of the time necessary to peruse an additional number that may be easier to memorize is worth the increased probability of achieving the benefit associated with a correct answer. Hence, there exists an optimal choosing time after which those who have freedom should just memorize a randomly selected number from the list, just as those who do not have freedom are forced to do. We however predict that freedom participants will again underestimate the costs of finding an easier number to memorize relative to its benefits, causing them to overchoose and underperform.

Results

Predicted affect and performance by predictors

Consistent with study 1, and in line with the dictates of normative choice theory, the majority of predictors forecasted that participants who had the freedom to choose would achieve a higher score than those who did not have this freedom (84.48%; χ^2 (1) = 27.59%, $p < .0001$), would like the test better (72.41%; χ^2 (1) = 11.65, $p < .001$), and would feel better while taking it (81.03%; χ^2 (1) = 22.34, $p < .0001$). Not surprisingly, then, predictors preferred having choice freedom (65.52%; χ^2 (1) = 5.59, $p < .05$).

Predicted affect and performance by freedom and no-freedom participants

Even after experiencing the task, the majority of participants thought that having choice freedom, relative to not having choice freedom, was more likely to lead to a higher test score (74%; χ^2 (1) = 11.52, $p < .001$) and more positive affect (liking: 80%; χ^2 (1) = 18, $p < .0001$; feelings: 82%; χ^2 (1) = 20.48, $p < .0001$). Consistent with prior results, the percentage of participants who preferred the freedom condition (64%) was higher than the percentage of participants who preferred the no-freedom condition (χ^2 (1) = 3.92, $p < .05$).

A thought-protocol analysis of the answers to the open-ended question about the perceived benefits of each condition revealed that 58% of the participants believed that the main benefit of having choice freedom was the possibility of picking the easier number to memorize because of its similarity to other relevant numbers (e.g., phone numbers, dates) or because of identifiable patterns in its structure (e.g., presence of repeated digits or patterns of digits). Another benefit mentioned by participants was the positive affect associated with a heightened sense of control, such as lower frustration and increased confidence (28%). On the other hand, the most commonly cited benefit of not having choice freedom was the possibility of focusing on memorizing one number without being distracted by other options (30%), whereas a small percentage of participants mentioned the possibility of being spared the negative feelings usually associated with choosing, such as regret (4%).

Actual affect and performance

A one-way ANOVA (freedom vs. no-freedom) conducted on test scores yielded the expected main effect ($F(1, 48) = 7.12$, $p < .01$). Contrary to predictions, the average performance was lower for freedom ($M = 23.09$, $SD = 12.72$) than for no-freedom ($M = 31.94$, $SD = 10.06$) participants.

Participants' affective responses to the memory test also differed from predictions. The two measures of process-induced affect, liking of the test and feelings experienced during the test, were highly correlated ($r = .85$) and were therefore collapsed into an overall affect measure. A one-way ANOVA conducted on this composite score yielded a main effect ($F(1, 48) = 5.94$, $p < .05$) revealing that freedom participants ($M = 5.86$, $SD = 2.30$) had a less positive affective response than no-freedom participants ($M = 7.14$, $SD = 0.98$).

What other variables, besides affect, explained this difference in performance? The difference could not be attributed to variations in perceived task difficulty because a one-way ANOVA conducted on this measure revealed that participants believed the test to be equally difficult across the two conditions ($M_{\text{freedom}} = 4.00$, $SD = 2.05$; $M_{\text{no-freedom}} = 4.05$, $SD = 2.30$; $F(1, 48) < 1$, *ns*). The lower performance of freedom participants could not be attributed to lower accuracy, either, as two separate one-way ANOVAs showed that they scored a lower number of correct answers ($M_{\text{freedom}} = 25.89$, $SD = 14.13$, $M_{\text{no-freedom}} = 36.00$, $SD = 11.10$; $F(1, 48) = 7.57$, $p < .01$) but also a lower number of incorrect answers ($M_{\text{freedom}} = 2.11$, $SD = 2.23$, $M_{\text{no-freedom}} = 4.68$, $SD = 2.95$; $F(1, 48) = 12.35$, $p < .001$). We calculated accuracy by dividing the number of correct answers by the total number of answers provided and conducted a one-way ANOVA on this accuracy score. This analysis showed no difference between the average degree of accuracy of freedom and no-freedom participants ($M_{\text{freedom}} = 0.88$, $SD = 0.19$; $M_{\text{no-freedom}} = 0.87$, $SD = 0.08$; $F(1, 48) < 1$, *ns*). Participants in the two choice conditions differed, however, in the attempted number of trials. A one-way ANOVA revealed that those in the no-freedom condition tried to memorize more numbers than those in the freedom condition ($M_{\text{freedom}} = 28.00$, $SD = 14.30$; $M_{\text{no-freedom}} = 40.68$, $SD = 10.81$; $F(1, 48) = 11.92$, $p < .001$).

To better understand the relationship between affect, trials, and score, we conducted a mediation analysis (Baron & Kenny, 1986). Initially, a regression with final score as dependent variable and affect as independent variable yielded a significant positive relationship between these two variables so that the more positive the affect, the higher the final test score ($\beta = 3.54$, $SE = 0.77$; $t(1, 48) = 4.62$, $p < .0001$). A second regression with number of attempted trials as dependent variable and affect as independent variable also showed a positive relationship between these two factors, such as an increase in affect led to an increased number of trials ($\beta = 4.20$, $SE = 0.87$; $t(1, 48) = 4.80$, $p < .0001$). In the third regression, final score was regressed on number of trials to reveal, once again, a positive relationship: the higher the number of trials, the higher the final test score ($\beta = 0.84$, $SE = 0.03$; $t(1, 48) = 30.41$, $p < .0001$). Finally, when score was regressed over affect, trials, and their interaction, only the effect of trials remained significant ($\beta = 0.77$, $SE = 0.10$; $t(1, 46) = 7.36$, $p < .0001$), whereas both affect and the affect by trials interaction were not significant (both *t*s (1, 46) < 1, *ns*). The Sobel test ($z = 4.02$, $p < .0001$) confirmed that the relationship between affect and score was mediated by the number of trials.

Taken together, these results show that choice freedom had a negative influence on participants' affective response during the

task, which in turn caused them to engage in fewer trials, resulting in an overall lower score. Conversely, the greater positive affect of participants in the no-freedom condition increased the number of attempts at memorizing numbers and improved the task performance. The direct temporal costs of choice (fewer trials), rather than its indirect costs (less positive affect), seem to drive the results of study 2.

Study 3

Method

One hundred thirty-four students at a large private US university participated in this study in exchange for extra class credit ($n_{predictors} = 61$, $n_{freedom} = 40$, $n_{no\text{-}freedom} = 33$). As in previous studies, participants were motivated to be accurate by the promise of a cash reward—an additional compensation of $50 to the two best performers. The study procedure and questionnaire were virtually identical to those in study 2, including the presence of a ticking-down timer in both freedom conditions and the disclosure of task performance only after the questionnaire was answered. There were, however, a few differences. First, the test consisted of sequentially memorizing three different 10-digit numbers randomly generated by the computer, one number at a time, for a total of three trials. Participants were told that their performance would depend on two factors: their ability to correctly memorize the numbers, and the time they spent taking the test. Specifically, they would gain 9-points for each correct number digit and 0.5 points for each second saved from a total allotted time of 6 min (2 min for each trial), and they would lose 1 point for each incorrect number digit. Second, freedom participants were not allowed to return to the previous list of numbers; they could only move from one trial to the next. Finally, predictors expressed their preferences and forecasts in a separate evaluation mode by using 9-point scales (1 = *not at all*/*very bad*; 9 = *very much*/*very good*).

Results

Predicted affect and performance by predictors

A one-way ANOVA (freedom vs. no-freedom) conducted on predictors' judgments expressed in a separate evaluation mode revealed a main effect ($F(1, 59) = 5.76$, $p < .05$). Predictors forecasted higher scores for freedom ($M = 6.03$, $SD = 1.96$) than for no-freedom participants ($M = 4.74$, $SD = 2.23$). The same one-way ANOVA revealed similar predictions for task-induced overall affect, calculated by averaging across predictors' scores for feeling and for liking of the test ($r = .80$), with freedom ($M = 4.94$, $SD = 1.98$) expected to result in more positive affect than no-freedom ($M = 4.07$, $SD = 1.88$), although this difference was only marginally significant ($F(1, 59) = 3.01$, $p < .09$). A one-way ANOVA on predictors' preferences yielded once again a main effect ($F(1, 59) = 23.98$, $p < .0001$) showing that predictors preferred the freedom ($M = 6.82$, $SD = 1.53$) to the no-freedom ($M = 4.44$, $SD = 2.26$) condition.

Predicted affect and performance by freedom and no-freedom participants

Consistent with our hypothesis, a significant majority of the participants (79.45%; χ^2 (1) = 25.33, $p < .0001$) predicted that freedom would lead to better performance in the memory test than no-freedom. In addition, across conditions a significant majority predicted more positive affect (86.30%; χ^2 (1) = 38.48, $p < .0001$) and better liking for the test (84.93%; χ^2 (1) = 35.63 $p < .0001$) for freedom participants. The majority of the participants (75.34%; χ^2 (1) = 18.75, $p < .0001$) also indicated their preference for the freedom condition.

Results of the thought-protocol analysis on participants' beliefs about the benefits of being in the freedom vs. the no-freedom condition were similar to those of study 2. The most-often cited benefit was the ability to select a number that was easier to memorize (67%), followed by more positive affect due to feelings of control, greater confidence, and less frustration (19%). On the other hand, 16% of participants realized that not having to choose the numbers to memorize made people more focused and more efficient.

Actual affect and performance

One-way ANOVAs conducted on test scores and overall affect ($r = .71$) revealed the hypothesized main effects. Contrary to predictions, participants in the freedom condition ($M = 327.3$, $SD = 52.33$) performed worse than participants in the no-freedom condition ($M = 362.29$, $SD = 29.72$; ($F(1, 71) = 11.64$, $p < .005$), and they also felt worse ($M_{freedom} = 5.55$, $SD = 1.95$, $M_{no\text{-}freedom} = 6.45$, $SD = 1.93$; $F(1, 71) = 3.93$, $p = .05$).

One-way ANOVAs conducted on test duration, measured as a logarithmic transformation of seconds ($M_{freedom} = 4.66$, $SD = 0.32$; $M_{no\text{-}freedom} = 4.78$, $SD = 0.34$; $F(1, 71) = 2.38$, *ns*) and perceived difficulty of the test ($M_{freedom} = 4.82$, $SD = 2.12$; $M_{no\text{-}freedom} = 4.03$, $SD = 2.17$; $F(1, 71) = 2.48$, *ns*), yielded no significant results. As the test-taking time was the same across the two choice conditions, the direct temporal costs of choice could not explain the observed difference in test scores. A one-way ANOVA conducted on the number of correct digits suggested, however, an indirect effect, because those in no-freedom ($M = 27.64$, $SD = 1.97$) remembered more correct digits than those in freedom ($M = 23.32$, $SD = 4.48$; $F(1, 71) = 26.33$, $p < .0001$).

We conducted a mediation analysis to disentangle the paths by which temporal costs are indirectly related to the choice outcome. An initial regression analysis revealed that the lower the process-induced affect, the lower the score ($\beta = 10.81$, $SE = 2.49$; $t(1, 71) = 4.34$, $p < .0001$). A second regression showed that the lower the affect, the lower the number of correct answers ($\beta = 0.88$, $SE = 0.22$; $t(1, 71) = 3.92$, $p < .001$). A third regression confirmed that score was positively related to number of correct answers ($\beta = 9.92$, $SE = 0.63$; $t(1, 71) = 15.79$, $p < .0001$). Finally, regressing final score on overall affect, we found that the number of correct digits, and their interaction, yielded only a significant effect for correct digits ($\beta = 8.87$, $SE = 0.95$; $t(1, 69) = 9.32$, $p < .0001$), whereas the effect for affect and the interaction did not reach significance (both $ts < 1$, *ns*). This mediation (Sobel test: $z = 4.00$, $p < .0001$) indicates that the more negative affect in the freedom condition was associated with lower accuracy and reduced the final score; conversely, the more positive affect in the no-freedom condition appears be linked to greater accuracy and a higher final score.

Discussion

In studies 2 and 3 participants could choose the task to perform or were assigned a predefined task during each trial of a memory test. Although these studies differed from study 1 in context and design, they replicated its findings. Participants who did experience the task, as well as those who did not, forecasted superior outcome and more pleasant affect in conditions of freedom compared with no-freedom. As a result, all participants expressed their preference for choice freedom. These predictions were incorrect because, despite being clearly quantified, the temporal costs of choice were underestimated relative to the benefits of choice, so that freedom led not only to an inferior outcome but also to worse feelings.

The advantage of selecting the easiest number to memorize was, therefore, overwhelmed by the disadvantages of the temporal costs of choosing. In study 2, freedom participants were given the same amount of time to complete the study than no-freedom participants but attempted fewer trials because they oversearched at each trial. In study 3, the more transparent communication of the direct temporal costs of choosing caused participants with freedom to spend the same amount of time on the task as those without freedom. In doing so, however, freedom participants underestimated temporal costs' indirect effects and as a consequence they experienced greater negative affect and committed more errors. Thus, when temporal costs were not highlighted (as in study 2), participants in the more-freedom condition underestimated the direct effect of these costs, and overchose. When temporal costs were highlighted (as in study 3), participants in the more-freedom condition experienced time pressure and had less cognitive resources for any given question, yet they again underestimated these indirect effects and overchose. In both cases, the suboptimal performance was due to relative underestimation of the temporal costs of choosing, but in study 2, it was a direct underestimation of the temporal costs, whereas in study 3 it was indirect underestimation of the temporal costs via its influence on cognitive ability.

So far, findings from three studies support our theory that individuals underestimate the temporal costs of choosing relative to the benefits of selecting the "best" option. These findings, however, could also be explained by an alternative account related to mood maintenance. The act of choosing has been shown to enhance positive affect (Langer, 1975). On the other hand, cognitively effortful tasks such as those employed in our experiments have been found to generate negative emotions (Garbarino & Edell, 1997). Participants in the more-freedom condition, therefore, may have initially enjoyed greater positive affect than participants in the less-freedom condition but had to strive harder to maintain it in the face of emotionally unpleasant tasks. This frustrated attempt at mood maintenance, in turn, may have caused in the more-freedom participants a greater depletion of the limited resource that allows individuals to exert self-control and attain goals (Vohs et al., 2008). As a result, the more-freedom participants experienced less positive affect and worse performances.

In study 4 we used a moderating factor, familiarity with the choice task, to tease apart the account based on cost-benefit misestimation from the alternative mood-maintenance explanation. Freedom and no-freedom participants in study 4 were either given the opportunity to familiarize themselves with the choice task before performing that task or not given this opportunity. If the mood-maintenance theory is correct, there should be no difference between the familiar and the unfamiliar conditions: in both conditions freedom participants would perform and feel worse than no-freedom participants, because the task in each condition was equally unpleasant. If the cost-benefit misestimation theory is correct, there should instead be a freedom-by-familiarity interaction: only in the unfamiliar condition would freedom participants perform and feel worse than no-freedom participants, because in the familiar condition participants would know the problem set well enough to realize in advance that they would benefit little from searching further.

This predicted moderating effect of familiarity also uncovers the boundaries of the detrimental effects of choice freedom observed in the previous studies. If individuals systematically oversearch because they misestimate the relative costs and benefits of finding the option that best matches their preferences, factors that ease this matching process should mitigate the negative effects of choice freedom. Indeed, research has shown that choosing from larger, vs. smaller, choice-sets becomes more advantageous when decision makers better understand their preferences (Chernev, 2003), when outcomes are considered satisfactory even if they are less than ideal (Iyengar, Wells, & Schwartz, 2006), and when the organization of the assortments helps choosers compare across different alternatives (Huffman & Kahn, 1998). In all these circumstances, preference-matching is improved by better knowledge of individual preferences and/or a more efficient search process. Because familiarity increases understanding of the differences among options as well as task efficiency (Alba & Hutchinson, 1987), the manipulation adopted in study 4 represents a different way of facilitating preference-matching to mitigate the disadvantages of choice freedom.

Study 4

Method

One hundred nine undergraduate students at a large private university in the United States received a basic monetary compensation of $5 to participate in this study in addition to a performance-based compensation. Participants were given a booklet containing a series of multiple-choice questions selected from the quantitative section of the GRE practice manual (Educational Testing Educational Testing Service, 2002) and were told that they could spend up to 20 min answering these questions. All the questions were of average difficulty, as they fell between the 42nd and 58th percentile in the distribution of previous examinees' correct answers.

The study was a 2 (freedom vs. no-freedom) $\times$ 2 (familiar vs. unfamiliar) between-subjects design. Participants were told either that they could choose 10 questions to answer from the 50 contained in the booklet (freedom condition) or that they had to answer the 10 questions contained in the booklet, in the order in which they were shown (no-freedom condition). Freedom participants were given one of 10 booklets, each containing a different sequence of the same 50 questions. The first 10 questions appearing in each of the freedom condition booklets were used to produce the 10 different booklets that were randomly given to participants in the no-freedom condition. Participants were told that they would gain 40 cents for each correct answer, lose 10 cents for each incorrect answer, and gain 20 cents for each minute saved out of the allotted 20-min test time. A timer in the upper right corner of the screen tracked the time spent on the test, and a counter in the lower right corner reminded participants of the number of questions they had already answered. Before taking the test, participants were either given 3 min to familiarize themselves with a sample of similar test questions (familiar condition) or were not given this possibility (unfamiliar condition).

To answer a question, participants had to enter the related question code into the computer and then click on the letter corresponding to their answer. The test ended when the 10 questions had been answered or when the 20 min had expired. As in the previous studies, after taking the test but before knowing their test results, participants were asked to indicate on a scale from 1 to 9 how they felt while taking the test (1 = *very bad*; 9 = *very good*). The amount of time spent taking the test and the number of correct answers were automatically recorded.

Results

A 2 (freedom vs. no-freedom) $\times$ 2 (familiar vs. unfamiliar) ANOVA conducted on task performance, measured as the total amount of money gained, revealed that the main effects for freedom and familiarity were not significant (both Fs (1, 105) < 1, *ns*). This analysis yielded a significant freedom-by-familiarity interaction (see Fig. 1a) that supports our cost-benefit misestimation theory rela-

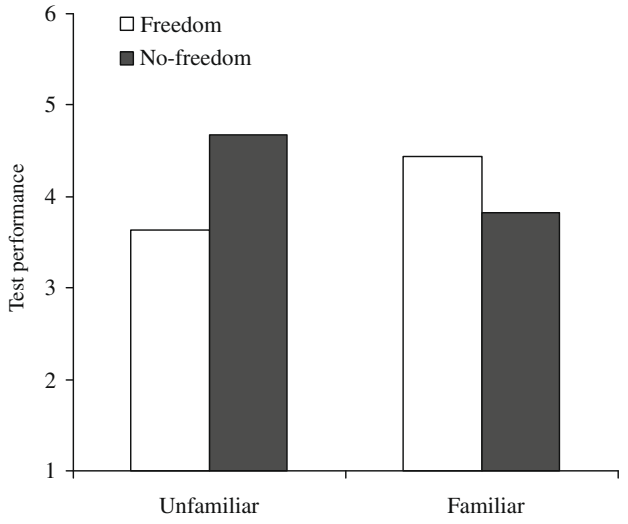

Fig. 1a. Study 4. Freedom and no-freedom participants' mean test performances by task familiarity, measured in US dollars.

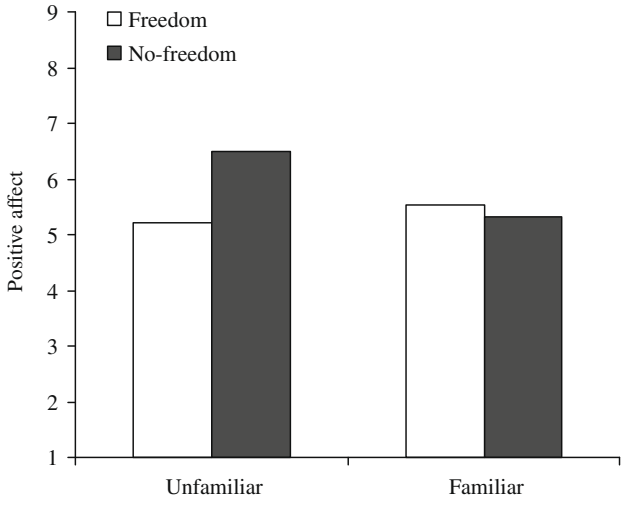

Fig. 1b. Study 4. Freedom and no-freedom participants' mean self-reported affect by task familiarity, measured on a 9-point scale (1 = *very bad*; 9 = *very good*).

tive to the alternative mood-maintenance theory ($F(1, 105) = 7.72$, $p < .01$). Replicating prior results, in the unfamiliar condition freedom participants performed worse than no-freedom participants ($M_{\text{freedom}} = 3.63$, $SD = 1.98$; $M_{\text{no-freedom}} = 4.68$, $SD = 1.52$; $F(1, 105) = 5.93$, $p < .05$). This difference was, however, not significant in the familiar condition ($M_{\text{freedom}} = 4.44$, $SD = 1.49$; $M_{\text{no-freedom}} = 3.82$, $SD = 1.20$; $F(1, 105) = 2.19$, *ns*). In addition, the difference between freedom participants' task performance in the two familiarity conditions was significant, indicating that, as predicted, freedom participants gained more money in the familiar condition relative to the unfamiliar condition ($M_{\text{familiar}} = 4.44$, $SD = 1.49$; $M_{\text{unfamiliar}} = 3.63$, $SD = 1.98$; $F(1, 105) = 3.65$, $p = .05$).

A parallel 2 (freedom vs. no-freedom) × 2 (familiar vs. unfamiliar) ANOVA conducted on affect yielded similar results (see Fig. 1b). The main effects for freedom ($F(1, 105) = 2.46$, *ns*) and familiarity ($F(1, 105) = 1.63$, *ns*) were both not significant, but the freedom-by-familiarity interaction was once again significant ($F(1, 105) = 4.85$, $p < .05$). Freedom participants ($M = 5.22$, $SD = 1.97$) felt less positive affect than did no-freedom participants ($M = 6.50$, $SD = 1.48$; $F(1, 105) = 6.92$, $p < .01$) in the unfamiliar condition, but in the familiar condition this difference in affect was not significant ($M_{\text{freedom}} = 5.54$, $SD = 1.79$; $M_{\text{no-freedom}} = 5.32$, $SD = 1.79$; $F(1, 105) < 1$, *ns*). The difference between freedom participants' affect in the two familiarity conditions was not significant ($M_{\text{familiar}} = 5.54$, $SD = 1.79$; $M_{\text{unfamiliar}} = 5.22$, $SD = 1.97$; $F(1, 105) < 1$, *ns*), ruling out the possibility that greater familiarity with the test questions made it easier for freedom participants to maintain their positive mood.

Additional analyses further supported our explanation that greater familiarity with the choice task enabled freedom participants to realize the little benefit associated with searching extensively for the best option. Participants spent, on average, 12.32 min ($SD = 3.85$) answering the questions out of the allotted 20-min test time. A 2 (freedom) × 2 (familiarity) ANOVA conducted on the logarithmic transformation of the number of seconds spent taking the test revealed a main effect for freedom ($F(1, 105) = 3.80$, $p = .05$), and a freedom-by-familiarity interaction ($F(1, 105) = 4.27$, $p < .05$), but no main effect for familiarity ($F(1, 105) = 1.93$, *ns*). Freedom participants ($M = 6.61$, $SD = 0.35$) spent overall more time on the task than no-freedom participants ($M = 6.49$, $SD = 0.35$). Test-taking time, however, depended on the extent to which participants were familiar with the choice task. In the unfamiliar condition, freedom participants spent more time taking the test ($M_{\text{freedom}} = 6.63$, $SD = 0.32$; $M_{\text{no-freedom}} = 6.37$, $SD = 0.41$; $F(1, 105) = 7.84$, $p < .01$), but in the familiar condition they spent the same amount of time as no-freedom participants ($M_{\text{freedom}} = 6.59$, $SD = 0.38$; $M_{\text{no-freedom}} = 6.60$, $SD = 0.24$; $F(1, 105) < 1$, *ns*).

The same 2 (freedom) × 2 (familiarity) ANOVA conducted on the number of correct answers showed only a significant interaction ($F(1, 105) = 5.91$, $p < .05$), whereas both main effects for freedom and familiarity were not significant (both Fs $(1, 105) < 1$, *ns*). Regardless of the longer time spent taking the test, in the unfamiliar condition there was no difference in the number of correct answers between freedom and no-freedom participants ($M_{\text{freedom}} = 6.74$, $SD = 2.94$; $M_{\text{no-freedom}} = 7.50$, $SD = 2.10$; $F(1, 105) = 1.43$, *ns*). Conversely, in the familiar condition freedom participants correctly answered more questions than no-freedom participants did ($M_{\text{freedom}} = 8.07$, $SD = 1.88$; $M_{\text{no-freedom}} = 6.68$, $SD = 2.18$; $F(1, 105) = 5.10$, $p < .05$).

Discussion

Study 4 results support our cost-benefit misestimation theory against the alternative mood-maintenance theory and also demonstrate the limits of the negative effect of choice freedom. When participants were not given the opportunity to familiarize themselves with the task, those who were free to choose which questions to answer spent more time but were not more accurate than those who were not free to choose; thus, replicating previous results, participants in the freedom condition felt and performed worse than those in the no-freedom condition. Greater task familiarity allowed freedom participants to realize that the options were similar to each other and that a more extensive, and costly, search would not necessarily lead to a better question choice. In the familiar condition, freedom participants spent, therefore, only as much time as no-freedom participants on the task, and they were even more accurate, filling the performance and affect gap between them and their no-freedom counterparts.

General discussion

Preference for freedom of choice is one of the most robust findings in decision-making research. Individuals experience psychological reactance when their freedom to choose is eliminated or

threatened with elimination (Brehm, 1966), and become depressed if they are not allowed to exercise control over their environment through choices (Seligman, 1975). Although decision makers may autonomously decide to avoid choosing when it is cognitively or emotionally difficult (Dhar, 1997; Luce, 1998), they still prefer to exercise a difficult choice than to be deprived of it (Bown, Read, & Summers, 2003). This preference is justified by the fact that in many cases the outcomes of free choice are objectively (Hotelling, 1929) or subjectively (Brehm, 1966; Festinger, 1957; Langer, 1975) superior, yet it persists even when individuals are worse off as a result of making their own choices (Botti & Iyengar, 2004; Botti & McGill, 2006).

This preference for choice has been attributed to a basic need for control (deCharms, 1968; Seligman, 1975) as well as to sociocultural norms that value decision autonomy (Beattie, Baron, Hershey, & Spranca, 1994). Choice is certainly both an innate drive and a powerful force that shapes cultures and societies, but in this paper we controlled for these accounts in order to propose a novel explanation for people's preference for choosing. Specifically, we hypothesize that preference for choice is caused by a systematic tendency to underweigh the direct and indirect temporal costs of searching for the best option relative to the benefits provided by that option. This relative underestimation of temporal costs causes people to expect more choice freedom to necessarily bring more positive outcomes than less choice freedom, and to seek choice even when it actually leads to worse decisions.

Results from the first three studies provide empirical support to our hypothesis by showing that, regardless of the elicitation mode and of whether they had experienced the choice task or not, participants predicted higher performance and a more pleasant affective experience in conditions of more freedom than in conditions of less freedom, and expressed their preference for more over less freedom. Contrary to these predictions, study participants who had more freedom performed worse and experienced lower positive affect than participants who had less freedom. The last study, in addition to ruling out an alternative explanation based on mood maintenance, restricts the detrimental effects of choices to situations in which participants are not familiar with the choice task. Familiarity has been shown to facilitate the matching between preferences and available alternatives, thereby reducing the disadvantages of choice (Alba & Hutchinson, 1987). Specifically, in our case the possibility of participants familiarizing themselves with the choice task before performing it helped them realize that the benefits of searching for a better option were limited by the similarity of the choice-set options.

To conclude, although choice is often associated with beneficial outcomes, in some circumstances this association fails. For example, research has shown that excessive choice options (Iyengar & Lepper, 2000), undesirable or undifferentiated options (Botti & Iyengar, 2004; Botti & McGill, 2006), equally-appealing yet conflicting options (Hsee & Leclerc, 1998), low preference articulation (Chernev, 2003), and complex decision-making processes (Huffman & Kahn, 1998) limit the advantages of choice by making individuals cognitively and emotionally distressed, and uncertain about their decisions. When the costs of making a choice exceed its benefits, choosers experience suboptimal outcomes and unpleasant feelings. In a poignant passage from Sylvia Plath's *The Bell Jar* (1971, pp. 84-85), the protagonist Esther Greenwood contemplates her different life choices and daydreams: "I saw myself sitting in the crotch of this fig tree, starving to death, just because I couldn't make up my mind which of the figs I would choose. I wanted each and every one of them, but choosing one meant losing all the rest, and, as I sat there, unable to decide, the figs began to wrinkle and go black, and, one by one, they plopped to the ground at my feet." According to our research, Esther is not alone.

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Appendix A

A.1. Experimental instructions—study 1

More-freedom condition (Multiple-set service)

This service starts by showing three randomly selected banks and their interest rates. If you decide to choose a bank from this initial set, you just click on it. If you are unsatisfied with the given selection of banks, you click on a button labeled "See Another Three Banks" and another set of three banks is displayed. Each time a new set of banks is displayed, the online service charges you $7. This includes the original set of banks displayed at the beginning of the test. The total return on your investment depends on your choice: If you choose, for instance, a bank with an interest rate of 3.92% from the third list you see, your total return will be $\$392 - 3 * \$7 = \$371$.

A.2. Less-freedom condition (one-set service)

This service starts by showing three randomly selected banks and their interest rates. You are charged $7 for this service. To choose your desired bank from these three you just click on it. Once you have selected the bank, the computer will calculate the total return on your investment: If you choose, for instance, a bank with an interest rate of 3.87%, your total return will be $\$387 - \$7 = \$380$.

Appendix B

B.1. Calculation of the stopping rule—study 1

Participants in the more-freedom condition were presented each time with three randomly generated interest rates between 3% and 4% and could choose whether to stop the search by selecting the highest (maximum) rate in the set or to continue the search by paying $7 to request another set of three randomly drawn interest rates. Unlike in the class of problems known as the "secretary problem," participants in this study were provided with information about the distribution of the rates, which was uniform. Because participants were given incentives for accuracy, we can safely assume that their objective (i.e., the criterion to measure the quality of the decision) was to maximize their overall return; in addition, we can presume participants' risk neutrality because of the small dollar amounts involved.

The setup of this study is therefore equivalent to the game proposed by Sakaguchi (1961) and utilized also by Rapoport and Tversky (1970), in which participants are allowed to make successive draws from a hypothetical population with the cumulative distribution function $F(x)$. Participants are allowed to stop the game at the end of each draw, and are paid an amount equal to the result of that draw minus the total cost of observations previously drawn. At each step, the decision of whether to continue depends on the value just drawn and the distribution of $F(x)$. If the cost per unit

observation $c > 0$, the optimum stopping rule is: stop with the first $x_n > \alpha$, where α is the root of the equation

$$\int_{\alpha}^{\infty} (x - \alpha) dF(x) = c.$$

In the case under investigation, $F(x)$ is $F(y \leqslant x)$, where y is a random variable corresponding to the maximum of n uniformly distributed variables. Hence:

$$F(y \leqslant x) = [(x - a)/(b - a)]^n$$

$$dF(x) = n[(x - a)/(b - a)]^{n-1}.$$

Substituting in the equation above,

$$\int_{\alpha}^{b} (x - \alpha) n[(x - a)/(b - a)]^{n-1} = c$$

and solving for $a = 3$, $b = 4$, $n = 3$, and $c = .07$, we obtain $\alpha = 3.77\%$.

The probability of getting a rate of 3.77% or higher at any given round is $1 - P$ (all three rates were <3.77%) = $1–(0.77)^3 = 0.543$. Using the geometric distribution, which is the distribution of the number of trials until the first success occurs, the average number of rounds (including the success round) = 1/0.543 = 1.84.

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